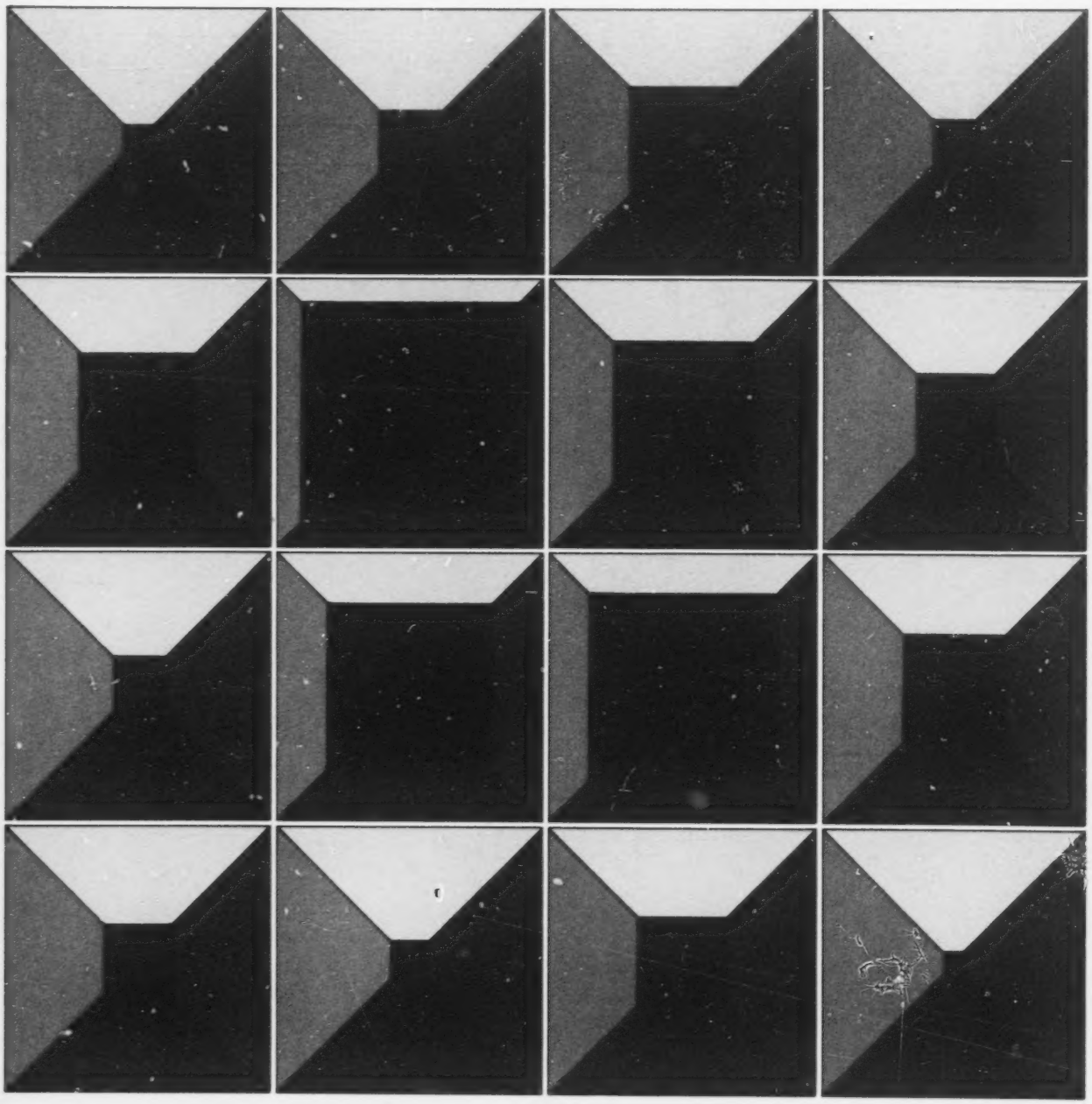
A CBO STUDY

Efficient Investments in Water Resources: Issues and Options

August 1983

Congress of the United States
Congressional Budget Office



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EFFICIENT INVESTMENTS IN WATER RESOURCES: ISSUES AND OPTIONS

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PREFACE

Over the last 150 years, the federal government has gradually accepted responsibility for most of the costs of developing the nation's water resources. Federal investments have provided valuable services to a developing nation, including navigation on inland waterways and coastal ports, irrigation of western lands, flood control in all major river basins, and hydroelectric power primarily in the West and South.

Today, with a more mature national economy and with most nationally important water projects in place, the need for a strong federal role in new water development is less compelling. The most likely future water resources needs--maintenance of existing facilities and new construction of local projects--could be met more efficiently if states, local governments, and direct beneficiaries had a greater responsibility for project costs, financing, and selection.

This study analyzes three options that are under Congressional or Administrative consideration. Each recognizes the changing nature of water development responsibilities and aims to combine cost-sharing reform with financing mechanisms and changes in decisionmaking processes that, taken together, would promote a more efficient water resources investment program. The Congressional Budget Office (CBO) has prepared this report at the request of the Water Resources Subcommittee of the Senate Committee on Environment and Public Works. In keeping with the CBO's mandate to provide objective analysis, this paper offers no recommendations.

Kenneth Rubin of CBO's Natural Resources and Commerce Division prepared this study, under the supervision of David L. Bodde and Damian J. Kulash. The author wishes to thank Everett M. Ehrlich, also of the CBO, for his support and valuable commentary; and Dr. Peter Rogers of Harvard University, Dr. Kenneth Frederick of Resources for the Future, and Dr. Gerald E. Galloway, Jr. of the U.S. Military Academy for reviewing and commenting on the manuscript. Patricia H. Johnston edited the manuscript, assisted by Nancy H. Brooks. It was prepared for publication by the ever-cheerful Angela Z. McCollough.

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SUMMARY

Widespread support is beginning to develop for fundamental redirection of the federal government's water resources policies. Traditionally, the federal government has played a major role in choosing, financing, and paying a large share of the costs of water projects. In contrast, the responsibilities of state and local governments and private users have been relatively small. This extensive federal participation was appropriate for the early development of the nation's major river basins, waterway transport systems, and western regions. It appears less so today as water investment priorities continue to shift from construction of new projects toward the management, repair, and modernization of facilities now in place and to projects of increasingly local character. The Congress, therefore, faces the task of reorienting federal water policies to conform to these changes.

Two components are central to any such policy reorientation. The first is greater state and local responsibility for project costs, financial arrangements, and project selection. The second is increased user fees to recoup those portions of project cost that provide private rather than public benefits. Taken together, these policy changes could lend strong incentives to states, local governments, and private beneficiaries to work with the federal government to ensure that the most cost-effective projects are built and maintained.

Many legislative approaches to carry out such a reorientation are possible. This paper concentrates on three that appear closest in intent and structure to those that have recently been considered by the Administration or the Congress:

- Establishing a self-sustaining federal loan fund to replace annual appropriations for local water resources projects.
- Replacing federal grants for projects of local interest with block grants to states, allowing greater local choice of investments.
- Targeting the remaining federal project grants toward water projects that are national in character.

ORIGINS OF THE FEDERAL ROLE--DEVELOPMENT AND PUBLIC GOODS

The federal role in water resources originated in the early 1800s, largely out of a concern for the nation's regional development and economic growth. Toward these ends, the federal government built a network of inland waterways to provide transport services to developing regions. The federal government also built and maintains a system of inland and coastal ports to aid commerce and provide for the national defense. Since 1902, the federal government has built almost 700 dams to provide water and power to help settle the West. And in the 1930s, the federal government began to develop the water resources of an entire river basin--the Tennessee--to stimulate economic growth in the South.

To promote growth and regional development, the federal government has paid an average of 70 percent of the combined construction and operating costs of such projects, leaving states, localities, and private users to carry the remaining 30 percent. Such subsidies have even been extended to cover some of the costs of providing marketable water services. For example, the federal government pays 94 percent of the cost of inland water transport services, 81 percent of irrigation water and recreation services costs, 84 percent of harbor dredging, and 64 percent of municipal water and hydroelectric power generation. The remainder of the costs are borne by nonfederal participants (see the Summary Table).

High federal shares of costs have also been justified on grounds that the federal government was the appropriate supplier of nonmarketable water services--termed "public goods"--such as flood prevention, fish and wildlife enhancement, or water quality control. These services benefit the public at large, but they offer no fiscal incentive to invite private investment. The federal government took on major responsibility for these often heavily capital-intensive undertakings for two reasons. First, until recently, few states had the fiscal capacity to afford such projects. Second, public benefits often accrued to clusters of neighboring states, leaving no single state with the incentive to pay for the development. Thus, since the 1930s, the federal government has paid between 80 and 90 percent of the costs of flood control dams, up to 97 percent of water quality control costs, and about 85 percent of fish and wildlife preservation costs.

SHIFTING NEEDS AND SHORTCOMINGS OF CURRENT POLICY

Although public benefits remain valid as a motivation for major federal involvement in providing nonmarketable water resources services, the continued subsidization of marketable products and services (for which user charges are appropriate), together with federal payments for public

SUMMARY TABLE. EFFECTIVE NONFEDERAL COST SHARES OF FEDERAL WATER RESOURCES DEVELOPMENT, BY PURPOSE AND AGENCY (In percents)

Project Purpose	Army Corps of Engineers	Bureau of Reclamation	Soil Conservation Service	Weighted Average of all Federal Water Agencies
Urban Flood Damage Reduction	17	a/	a/	20
Rural Flood Damage Reduction	7	10	27	11
Irrigation	19	18	54	19
Municipal and Industrial Supply	54	71	100	64
Hydroelectric Power	61	65	b/	64
Water Quality Control	3	82	b/	60
Fish and Wildlife Preservation	11	13	57	14
General Recreation	17	18	63	19
Inland Waterways	6-11 c/	7	b/	6
Commercial Harbors	16	b/	b/	16
Agency Mean	20	37	49	30

SOURCE: Adapted by Congressional Budget Office from Water Resources Council data.

a. Agency reported a cost category for this purpose but not cost sharing.

b. Agency reported no activity for this purpose.

c. Receipts from the fuel tax implemented pursuant to the Inland Waterway Revenue Act of 1978 could increase the nonfederal share to as much as 11 percent from the Water Resources Council's 1974 calculation of 6 percent.

investments of state or local interest, appear to create rather than solve problems.

Since the inception of many water resources programs, the United States has reached economic maturity, and the development objectives of many original water resources policies are now largely accomplished. The inland waterway system, for example, is well-established and needed coastal harbors are built. The West, once unsettled, now has a mature industrial and agricultural base. Most major interstate river basins have been developed to meet the needs of past generations. Water policy now confronts different objectives--namely, the maintenance and rehabilitation of water resources structures and services that are already in place and construction of new projects of mainly local importance, with user support when feasible. Further, many states that once lacked the fiscal capacity to finance their own water services have grown in economic strength. Finally, the cost-sharing, financing, and management arrangements stipulated under current policy no longer mesh well with these changing circumstances.

Economic Distortions

Federally subsidized marketable water services tend to be undervalued and overconsumed by users. This stimulates demand for continued subsidies rather than promoting cost-effective, user-supported investments. Federal water subsidies, for example, have resulted in irrigation of farm land at costs per acre far in excess of that land's productive value. In effect, general taxpayers pay for irrigation projects that beneficiaries would not support if water fees reflected the full cost of development. Moreover, federal subsidies--hence, low prices for water--blunt western farmers' incentive to conserve water and encourage cultivation of water-intensive crops, such as cotton or rice, in arid regions. For example, southern growers, who would otherwise have a natural competitive advantage in growing cotton, are forced to accept lower prices and reduced returns as cotton production continues to shift to western states. Similarly, subsidies to freight shippers on the inland waterways amount to more than one-fourth of the costs of the barge industry, many times the federal subsidy to competing freight modes, such as railroads, trucks, and oil and gas pipelines. By encouraging the use of barges, this subsidy stimulates demand to build more locks and dams with federal dollars. Thus, proportionately more of the cost of freight is transferred from direct users to general taxpayers.

State and local governments may experience similar incentives for overconsumption of nonmarketable water services subsidized by the federal government. While self-financed flood control projects may never be realistic, communities have an incentive to overvalue flood-protected land

so long as flood protection is perceived as an essentially "free" good. In such cases, the costs of flood control can exceed the real development value of flood-free land. Moreover, federal provision of flood-prevention structures discourages communities from exploring more cost-effective alternatives.

Policy Issues

A great deal of evidence suggests that water resource investments could be made more cost-effective and equitable if they depended more on users and states for financial support. To these ends, the Congress confronts three basic policy issues.

Project Selection. Investment decisions are now made by the Congress based, in part, on requests from state or local governments or private beneficiaries and, in part, on engineering, environmental, and economic analyses performed by the federal water agencies. This system, however, offers little guarantee against undertaking projects of questionable merit. Higher cost shares for users and for local governments would provide incentives for greater local involvement in project selection, more realistic project evaluation, and, therefore, more cost-effective investments. For projects of national significance, an independent review board could avoid the lengthy process (as long as 28 years) that now characterizes the evolution of many water projects.

Project Financing. Federal financing without repayment requirements can perpetuate current subsidies. Yet strict reliance on state financing could prevent the construction of some needed projects, especially in relatively poorer states. This suggests that a mix of federal and state financing would best serve the goals of efficiency and equity.

Cost Sharing. Inefficiencies created by subsidies to direct beneficiaries and to state and local governments could be reduced if cost-sharing policy were based on two conventions. First, direct beneficiaries should pay for marketable benefits consumed, and second, all levels of government should share the costs for water projects that provide nonmarketable benefits.

FEDERAL POLICY OPTIONS

The water resources policy options considered in this report are representative of recent proposals under Congressional consideration. Each option would place greater responsibility for project selection, financing,

and repayment on states, local governments, and direct beneficiaries. This emphasis could provide greater incentives than current policy to work with the federal government to ensure that the most cost-effective projects are built and maintained, and to provide an equitable distribution of government services. But this shift in responsibility would also affect the federal and state budgets and private-sector beneficiaries of public works projects.

Federal Loan Program

Rather than continuing the dominant federal role in financing and decisionmaking for local water projects, a federal loan program could be used to increase nonfederal responsibility. Federal loans would provide up-front capital for state and local investments. These loans would be repaid from user fees, to the extent that marketable benefits are provided, and from state funds for half of the nonmarketable benefits. Though financed with federal loans, these projects would be selected and managed at the state or local level. Nationally important projects, on the other hand, would continue to be selected, financed, and operated by the federal government, with costs recovered through federally administered user fees when applicable.

Investment Efficiency. The availability of federal loans would ensure the ability of all states to build needed local projects, even if they were unable to finance such projects themselves. The federal loans would not be committed until the applying state met two conditions: establishment of a cost-recovery system based on user fees for projects with marketable benefits; and state acceptance of legal responsibility to repay at least half the cost of all projects with nonmarketable benefits. This approach would focus user support on the most needed projects, based on realistic, unsubsidized prices of water and water-related services. Similarly, those projects perceived by state governments to have the highest public return on their investments would be promoted first. This would allow states and localities to choose their own local investments without undergoing the time-consuming process demanded by current policy.

Projects of national importance could be selected by an independent federal and state review board, subject only to Congressional appropriations. Such a board might be freer to judge the economic merits of an investment without being subjected to the political pressure that is now brought to bear on the Congress by special local interest groups.

Effects on Federal and State Budgets and Users. The potential efficiency gains of a federal loan program must be balanced against three effects. First, in the early years, before state and user payments began to

accrue, high state financing demand could deplete the loan fund, putting budgetary pressure on the federal government. Federal capital outlays could increase from the fiscal year 1982 level of $2.3 billion to over $4 billion if water resources projects that extend beyond current policy were undertaken. In time, this problem would diminish as user fees and state repayments replenished the fund. Second, although a loan program would accommodate the repayment capacity of most states, it would impose additional burdens on the states, including new financial responsibilities for project evaluation, management, and cost recovery. Finally, recipients of marketable benefits would have to pay substantially more for such services or reduce their consumption. Many users might have to accept reductions in services because of increased costs.

Federal Block Grants

Under block grants, states would again take the lead in selecting local projects. Each year, the Congress would appropriate investment funds for distribution to the states, based on population, land area, or other measures of "need." A state could use the federal funds apportioned to it for local water projects, provided that the state financed half the projects' costs. States would have the option, but not the requirement, to recover their investment with local user fees. The federal government would continue to finance projects of national importance, selected by an independent federal and state review board. Federally administered user fees would recover federal expenditures when appropriate.

Investment Efficiency. Under block grants, economically efficient intrastate projects would be less assured than under the loan program option. This would occur because user fees would not be mandatory, and states could choose to subsidize groups of users if they so desired. States would be encouraged to institute user fees for intrastate projects, however, because of their increased financing responsibilities. Interstate projects, on the other hand, would be conditioned by users' willingness to pay appropriate fees, thus helping to guide federal investments toward projects with the greatest return. Interstate project selection by an independent review board would also help ensure cost-effective federal spending.

Effects on Federal and State Budgets and Users. Under the block grant option, the 1982 level of federal appropriations for water resources--about $3.7 billion for construction and operations--could have generated a total of about $5.2 billion in combined federal and state investments. Such potential gains in efficiency, however, would have to be balanced against the increased state financing burden implied by matching grants. Under this block grant approach, states would have to raise

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50 percent of the cost of the average water project before work could begin, compared to the current practice of repaying about 30 percent of project costs, sometimes over a 50-year period aided by user payments. This could result in only the wealthiest states' building water projects. In addition, shippers using the inland waterways would pay user fees, which in turn could eliminate traffic on some routes, reduce farm incomes during slack markets, and cause local economic dislocations.

Federal Project Grants Under A Limited Federal Role

Under this option, the federal government would give states the full responsibility for new local projects--selection, financing, and cost recovery (at their discretion). The federal government, on the other hand, would continue to select and finance projects of national significance as determined by an independent review board. Financial and administrative responsibility for all currently operating and authorized local projects would be transferred to the states over a period of ten years. Any new projects that were interstate or international (affecting Canada or Mexico, for example) in scope or contained national security implications would be constructed under current financing conventions. But federally administered user fees would be instituted to recover appropriate portions of project costs. Receipts from such fees would accrue to the federal government and to the states in proportion to their financing contributions.

Investment Efficiency. Federally administered user fees would match costs to beneficiaries, thus linking new federal investments with users' willingness to pay and reducing the tendency for overinvestment. Federal funds would no longer support projects of mostly local significance, and these freed federal resources could be redirected toward other national needs. The states, faced with financing and paying for intrastate water projects, would have a stronger incentive to make priority investments first, recovering their costs through state user fees as they saw fit. The absence of federal financing, however, could prevent the construction of some worthwhile projects in economically depressed states. In such cases, opportunities for cost-effective investments could be lost.

Effects on Federal and State Budgets and Users. This option would place the greatest financial pressure on the states through added costs of operating and managing existing intrastate projects, financing new intrastate projects, and meeting current cost-sharing requirements for nationally important projects. For example, if this option was in place in 1982, out of about $3.7 billion in federal expenditures for water resources that year, about $1.5 billion, or 41 percent, would have been a state responsibility. Transferring this responsibility to the states over ten years, however, could

reduce sudden financial burdens and allow more time for states to develop new programs. Two types of states would be at a relative disadvantage under this option: those that have relied most heavily on federal subsidies or technical expertise, and those with the least ability to raise development capital. Many activities of federal agencies would revert to the states, including small watershed improvement projects of the Soil Conservation Service, local flood control projects and some port dredging undertaken by the Corps of Engineers, and up to 40 percent of the Bureau of Reclamation's construction activities. As in the other options, users of inland waterways and nationally important ports would pay more for navigation services than they now do.

CHAPTER I. INTRODUCTION

The appropriate federal role in developing and managing the nation's water resources has been a contentious issue facing the Congress since the federal government first assumed responsibility for navigation projects in 1826. Over the years, federal policies for selecting and sharing the costs of water projects have responded to the needs of an expanding industrial and agricultural economy. Federal water development objectives have included regional economic development, national defense, and creation or preservation of noneconomic benefits that the private market would not otherwise supply. To achieve these national objectives, the federal government has assumed most of the responsibility for financing and paying for water projects. Because many of the early water projects served interstate needs, decisionmaking has become centralized at the national level.

The Congress has always recognized that water projects are investments and that the expenditure of public resources should return the greatest possible net benefits to the nation. But this principle--often referred to as economic efficiency--has never been fully integrated into federal water development programs. Only recently have attempts been made to formally incorporate the efficiency principle into water development guidelines. After 150 years of building federal water projects, new projects are diminishing in favor of more efficient operation, maintenance, and rehabilitation of existing water projects. Most of the large, federally important water projects were built over this period, and remaining construction needs are focused on smaller intrastate projects.

With this transition in water resource needs, it seems logical to expect the way the federal government deals with these needs to change also. Federal water policies put in place to stimulate development cannot be expected to address the emerging Congressional concern for economic efficiency. In this regard, the three most important policies for current Congressional consideration are water project cost sharing, financing, and decisionmaking. Taken together, high federal cost assumption and complicated administrative processes for evaluating and selecting projects are the source of most of the inefficiency in federal water resources development programs.

PLAN OF THE PAPER

Chapter II presents background information on federal water resources programs, roles of the federal agencies and the Congress, and current water project cost-sharing policies. Chapter III documents the underlying changes in water development priorities. In Chapter IV, the economic efficiency objective is defined as it applies to water resources investments and in terms of implications for changing water project cost-sharing conventions and decisionmaking processes. Chapter V evaluates three options that could lead to a more efficient investment program for water resources.

CHAPTER II. FEDERAL WATER RESOURCES DEVELOPMENT POLICIES

Although about 20 federal agencies are, to a degree, responsible for about 30 kinds of water resources development, four agencies account for most federal activity: the U.S. Army Corps of Engineers (Corps), the Bureau of Reclamation (Bureau) in the Department of the Interior, the Soil Conservation Service (SCS) in the Department of Agriculture, and the Tennessee Valley Authority (TVA). Together, these agencies and the Congress make most of the water project investment decisions with limited nonfederal input. This chapter presents background information about the water development authority of these four agencies, their water project cost-sharing policies, and the roles these agencies and the Congress play in the decisionmaking process.

HISTORY OF FEDERAL WATER PROGRAMS

All water resources investments originated as state or local responsibilities, but as the nation expanded and water problems entered into national consciousness, new federal programs were developed to deal with those problems. 1/ Federal intervention has been justified principally on grounds of promoting regional economic development.

Navigation

The Gallatin Report of 1808 proposed a nationwide, federally subsidized system of navigational canals and locks and dams, justified on grounds of economic development of the West and on national defense needs. The nation's rivers were considered the principal means of transportation linking westward expansion with the more developed eastern half of the country. Thus, federal authority for constructing the inland waterways and ports and harbors began with the first Omnibus Rivers and Harbors Act in 1826. This and successive Rivers and Harbors Acts have enabled the Corps of Engineers to develop a navigational improvement program for construction, operation,

1. See Beatrice Hort Holmes, A History of Federal Water Resources Programs, 1800-1960, U.S. Department of Agriculture Miscellaneous Publication No. 1233 (June 1972).

and maintenance of the inland waterways system, including navigational locks and dams and maintenance dredging of the nation's ports and harbors. In fiscal year 1974, the federal share to complete all authorized water projects, termed "exposure," would have been about $40.5 billion. 2/ Of that total, waterway projects accounted for 16 percent and commercial harbor projects for about 3 percent (see Table 1). In fiscal year 1982, the Corps spent about $1.3 billion to construct and operate inland navigation and commercial harbor projects (35 percent of 1982 combined water resources appropriations of the four main federal water agencies).

Flood Control

Flood control remained a local concern until the 1860s when the Corps of Engineers recommended extensive construction of flood control levees in the Mississippi Valley to protect new settlements. The rationale for federal intervention was the uncoordinated, ineffective local protection efforts and projected costs beyond the financial capability of the states and localities. The Corps' flood control activities expanded as the country grew and eventually incorporated the multiple-purpose reservoir concept (impounding stream flow for irrigation, navigation, recreation, hydroelectric power, and municipal water supply as well as for flood control).

At about the same time, in the late 1940s, the Soil Conservation Service was given the authority to construct smaller, upstream flood control structures in conjunction with its assistance program to local agricultural

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2. The remaining federal cost to complete an authorized project is defined as exposure. In 1975, the Water Resources Council compiled federal exposure by project purpose based on 4,796 projects that were authorized as of 1974 (see Options for Cost Sharing--Part 5A, Planning and Cost Sharing Policy Options for Water and Related Land Programs, November 1975). Some of these projects were active, but others had been authorized as early as 1884 and never acted upon. Though incomplete, this data base was a blend of then-contemporary needs and historical federal priorities. Today, the total federal water project exposure--about $60 billion--is roughly equivalent to the 1974 level after accounting for inflation. The current allocation of total federal exposure among project purposes is also roughly equivalent to the 1974 allocation, because no new projects have been authorized since 1976.

TABLE 1. DISTRIBUTION OF FEDERAL WATER RESOURCES CAPITAL EXPOSURE AS OF FISCAL YEAR 1974, BY PROJECT PURPOSE

Project Purpose	Capital Costs (In percent)
Waterways	16
Commercial Harbors	3
Urban Flood Damage Reduction	21
Rural Flood Damage Reduction	19
Irrigation	7
Hydroelectric Power	6
Municipal and Industrial Supply	4
Water Quality Control	8
Fish and Wildlife Preservation	2
General Recreation	7
Other	7

SOURCE: U.S. Water Resources Council, Options for Cost Sharing--Part 5A, Planning and Cost Sharing Policy Options for Water and Related Land Programs (November 1975).

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organizations. Today, all four federal water agencies build flood control works. Flood control projects accounted for about 40 percent of the total federal capital exposure for authorized water projects as of fiscal year 1974 (see Table 1). In fiscal year 1982, about $1.3 billion in federal expenditures were made for this purpose (35 percent of 1982 combined water resources appropriations of the four federal water agencies).

Irrigation

With the passage of the Reclamation Act in 1902, the Bureau of Reclamation was given the responsibility for developing western water resources for irrigation and later for hydroelectric power. The purpose of the act was to promote economic development of the West and settlement of western public lands by offering inexpensive federally developed water and power to family farmers. Originally, western farmers were to repay the entire federal investment without interest (using a revolving fund) over ten years. But, costs escalated and many farmers could not meet their repayment obligations. As a result, several acts between 1902 and 1939 relaxed the original financial terms and established the present "ability to pay" criterion. By 1980, 161 irrigation and related projects had been constructed or authorized by the Bureau. Irrigation projects accounted for about 7 percent of the total federal capital exposure for authorized water projects as of fiscal year 1974 (see Table 1). Over the last ten years, annual Bureau spending for irrigation has accounted for about 6 percent of annual combined water resources appropriations of the four main water agencies.

Hydroelectric Power

Prior to 1906, hydroelectric power projects were undertaken by private parties, sometimes with federal permission (if on navigable waters) or under special federal leases for use of surplus water. But in that year, the Secretary of the Interior was authorized to develop hydroelectric power at reclamation projects. In 1912, the Corps was given discretionary authority to add water power provisions to navigation dams. Five years later, the Flood Control Act of 1917 required the Corps to include hydropower provisions as part of flood control dams when economical. In 1933, the TVA was empowered to exercise all federal water and power functions on the Tennessee River system, including the construction and authorization of hydroelectric power projects. Today all three agencies plan, construct, and operate hydroelectric power facilities. In fiscal year 1974, these projects accounted for about 6 percent of the total federal water project exposure (see Table 1).

Multiple Purpose River Basin Development Under the TVA

During the 1930s depression, the federal government created the Tennessee Valley Authority to promote economic development of an entire river basin--the Tennessee River system--by constructing facilities for flood control, navigation, and hydroelectric power generation. By 1953, the TVA had built 20 multiple-purpose dams on the Tennessee River mainstem and major tributaries. In 1981, the TVA operated 25 multiple-purpose dams, and nine single-purpose hydroelectric power generation facilities with total water resources appropriations of about $67 million. The TVA spent about $25 million in fiscal year 1982 for constructing new water resources projects (multipurpose dams, flood control facilities, navigational facilities, and recreational facilities).

Environmental Enhancement

Toward the late 1950s, the federal government again expanded its role in water resources development by embracing environmental enhancement objectives--water quality control, recreation, fish and wildlife development, ecological protection, and municipal water supply. The four federal water agencies together have obligated a relatively small percentage of their annual construction and operation budgets for these five purposes. For example, as of fiscal year 1974, the federal exposure for these agencies on the five environmental purposes combined accounted for only 14 percent of the total federal exposure (see Table 1).

CURRENT COST-SHARING POLICY

No unified national policy exists for sharing water project costs among the federal government, state and local governments, and direct users. Cost-sharing conventions have been shaped incrementally for each federal water agency through a series of federal statutes and administrative rules dating back to the turn of the century. Consequently, federal shares for the same type of water project differ among the federal water agencies. Within a given agency, cost-sharing rates can also vary for different technical solutions to the same water resources problem. There are two ways of viewing current cost-sharing rates: in terms of nominal cost-sharing rates, that is, those named in authorizing or policy legislation; and in terms of effective, composite cost-sharing rates that represent actual cash or contributions-in-kind paid by each participant over the project life. Effective nonfederal rates are generally lower than nominal rates.

Nominal Cost-Sharing Rates

Nominal cost-sharing rates vary widely from program to program and from agency to agency primarily because of 80 years of incremental water policymaking (see Table 2). For example, cost-sharing rates and terms for rural flood damage reduction were established for the Corps in 1928 and 1936, for the Bureau in 1940 and 1956, and for the SCS in 1954 (see Table 3). In addition, the Congress has often added new cost-sharing provisions, or made special exceptions, each time new projects were authorized. New provisions rarely replaced older ones; usually, they were added on, creating inconsistent, often confusing sets of rules and regulations.

Corps of Engineers. Under current policy, nonfederal cash contributions are not required for commercial navigation projects (ports, harbors, and waterways); structural flood control projects (reservoirs, levees, flood walls, and the like); hydroelectric power projects; water supply components of multipurpose reservoirs; or joint costs of fish and wildlife enhancement, recreation, or water quality features of multipurpose projects. Up-front cash contributions are required from nonfederal sponsors to cover 25 percent of separable fish and wildlife costs (for example, fish hatcheries) and 50 percent of separable recreation costs (such as boating or swimming facilities). For Corps projects, nonfederal sponsors are required to provide necessary land easements and rights-of-way. On average, they have accounted for 14 percent of urban flood control capital costs, 5 percent of rural flood control capital costs, 14 percent of port development costs, and 5 percent of inland waterway project capital costs. Nonfederal participants must repay within 50 years the capital costs of providing water supply storage and hydroelectric power.

The Corps pays all operation and maintenance (O&M) costs for navigation projects, major flood control reservoirs, and joint costs of multipurpose reservoirs. Nonfederal sponsors pay O&M for all other types of projects--local flood control, drainage, hydropower, water supply, irrigation, and separable cost of multipurpose reservoirs.

Bureau of Reclamation. Up-front cash payments are not specifically required from nonfederal sponsors of Bureau projects. 3/ Minimum non-

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3. An exception to this rule occurred in the Colorado River Basin Project Act Amendments of 1982 (P.L. 97-373), which required that nonfederal interests make up-front contributions of 20 percent of selected features of the Central Arizona Project. Local farmers supported this requirement and sought private financing in the bond market.

TABLE 2. CURRENT NOMINAL NONFEDERAL CAPITAL COST-SHARING RATES, BY PROJECT PURPOSE (In percents) a/

Project Purpose	Corps of Engineers	Bureau of Reclamation	Soil Conservation Service	Weighted Average 20 Federal Agencies
Urban Flood Damage Reduction b/	0-20	--	--	17
Rural Flood Damage Reduction b/	0-20	0-20	0-20	12
Drainage	50	--	50	41
Irrigation	50	0-20 c/	50	64
Municipal and Industrial Supply	100 d/	100 d/	50	81
Water Quality Control	0	25	e/	24
Fish and Wildlife Preservation	0-25 f/	25	50	20
General Recreation	0-50 g/	50	50	22
Commercial Harbors b/	0	--	--	10
Inland Navigation b/	0	--	--	5
Hydroelectric Power	100 d/	100 d/	--	74

SOURCE: U.S. Water Resources Council, Options for Cost Sharing--Part 5A (November 1975).

a. Tennessee Valley Authority (TVA) data excluded. There are no nominal cost-sharing requirements for TVA projects comparable to those for the other agencies. TVA repayment terms are based on selling electric power rather than on the traditional procedure of allocating costs by project purpose. See explanation in text.
b. Nonfederal participants must contribute necessary land, easements, and rights-of-way, which in dollar terms could total as much as 20 percent of total project capital costs.
c. Variable according to "ability to pay," but generally less than 20 percent.
d. Repayment only, financing not required.
e. Not established.
f. Nonfederal share of direct separable costs is 25 percent.
g. Nonfederal share of direct separable costs is 50 percent.

TABLE 3. MAJOR FEDERAL LEGISLATION AUTHORIZING COST SHARING, BY PROJECT PURPOSE

Project Purpose	Affected Agency	Authorizing Legislation
Urban Flood Damage Reduction	Corps	Flood Control Act of 1936 (P.L. 74-738)
		Flood Control Act of 1938 (P.L. 75-761)
Rural Flood Damage Reduction	SCS	Watershed Protection Act (P.L. 83-566)
	Corps	Flood Control Act of 1936 Flood Control Act of 1938 Flood Control Act of 1928 (P.L. 70-391)
	Bureau	Small Projects Act (P.L. 84-984) Reclamation Projects Act of 1939 (P.L. 76-260)
	TVA	TVA Act (P.L. 73-017)
Drainage	SCS	Soil Conservation Act (P.L. 40-460) Watershed Protection Act
	Corps	Flood Control Act of 1944 (P.L. 78-534)
Irrigation	SCS	Soil Conservation Act Watershed Protection Act
	Corps	Flood Control Act of 1944 Reclamation Act of 1902 (P.L. 57-161)
	Bureau	Small Projects Act Reclamation Projects Act
Municipal and Industrial Water Supply	SCS	Watershed Protection Act

(Continued)

TABLE 3. (Continued)

Project Purpose	Affected Agency	Authorizing Legislation
Municipal and Industrial Water Supply (Continued)	Corps	Water Supply Act of 1958 (P.L. 85-500)
	Bureau	Small Projects Act Reclamation Projects Act
Water Quality Control (Point Source)	Corps	Federal Water Pollution Control Act of 1972 (P.L. 92-500)
Fish and Wildlife Preservation	SCS	Watershed Protection Act
	Corps	Flood Control Act of 1944 Water Resources Protection Act of 1965 (P.L. 89-072) Water Resources Development Act of 1974 (P.L. 93-251)
	Bureau	Water Resources Development Act of 1974
Ports and Harbors	Corps	Rivers and Harbors Act of 1920 (P.L. 66-263)
Inland Waterways	Corps	Rivers and Harbors Act of 1920
	TVA	TVA Act
Hydroelectric Power	Corps	Flood Control Act of 1944
		1937 Bonneville Power Act (P.L. 75-329)
	Bureau	Reclamation Projects Act
	TVA	TVA Act

SOURCE: U.S. Water Resources Council, Options for Cost Sharing--Part 8D, Planning and Cost Sharing Policy Options for Water and Related Land Programs (November 1975).

federal shares are established by project type, but those shares may be paid with any combination of cash, contributions-in-kind (land, easements, rights-of-way), or repayments over time. For irrigation projects, capital costs are repaid (without interest) based on a calculation of farmers' ability to pay, which generally covers only about 10 percent of total project capital costs. Nonseparable capital costs allocated to fish and wildlife and recreation costs for facilities located on federal land are paid by the federal government. Operation and maintenance of all Bureau projects are the responsibility of nonfederal participants.

Soil Conservation Service. Prior to construction of any SCS project, a project agreement document must be signed by the responsible nonfederal entity endorsing that the following three conditions are satisfied:

- All land affected by the project will be purchased by or is already owned by the responsible nonfederal entity.
- The appropriate nonfederal share is secured in an escrow account and is available for payment of construction costs as performed and billed.
- Operation and maintenance will be performed and paid for by the nonfederal entity.

The nonfederal capital share of most SCS projects is 50 percent, except for structural flood control (0 percent) and nonstructural flood control (20 percent). 4/

Tennessee Valley Authority. There are no nominal cost-sharing requirements associated with TVA projects comparable to those of the other three federal water agencies. The TVA Act, as amended, established repayment terms for federal outlays based on selling electric power rather than on the traditional procedure of allocating project costs to purposes and recovering portions of those costs according to specific nonfederal cost-sharing rates.

The Amendments of 1959 required two types of payments to the U.S. Treasury from net power proceeds: a return on the federal appropriations

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4. Structural flood control entails building structures to contain flood waters or otherwise prevent flood damages (dams, levees, dikes, flood walls). Nonstructural flood control reduces flood damages without building structures (zoning against floodplain development, early warning and evacuation systems, flood-proofing buildings).

for power facilities and repayment of the dollar amount of invested capital. The amount of return payable each year, beginning in 1961, is based on the appropriation investment at the beginning of that year and the average interest rate payable by the U.S. Treasury on its total marketable public obligations as of the same date. The capital repayment schedule was fixed at $10 million per year between 1961 and 1965; $15 million per year between 1966 and 1970; and $20 million each year thereafter, until a total of $1 billion had been repayed to the U.S. Treasury. As of the end of 1982, a total of $370 million of the capital debt had been repayed. Return on appropriation investment totaled about $1.2 billion as of 1982.

Effective, Composite Cost-Sharing Rates

Nominal cost-sharing rates reflect the intent of water resources legislation regarding who should be responsible for paying the costs of water projects. But nominal rates provide little information about who actually pays how much over the project life. Effective, composite cost-sharing rates do exactly that by accounting for capital repayment subsidies, such as repayment without interest (irrigation projects); interest-free start-up periods (water supply, hydropower, and irrigation); and low, fixed-interest rates over long periods of time (all projects). In a single project rate, effective, composite cost shares reflect the ultimate cost burden on all participants by combining capital contributions, the cash value of contributions-in-kind, and the discounted present value of annual operating costs.

For example, consider a Bureau project with a capital cost of $14 million that is financed entirely by the federal government. The project would provide irrigation, municipal and industrial (M&I) water supply, and fish and wildlife benefits. The irrigation component costs $8 million and is to be repaid by the local sponsor in full over 50 years without interest. The M&I component costs $3 million and is to be repaid in full over 50 years at an interest rate of 6 percent. Fish and wildlife costs ($3 million) are not repaid by the local sponsor. All operating costs, about $100,000 per year, are paid locally. Thus, the local sponsor would pay $11 million of the $14 million project, for a nominal capital cost-sharing rate of 79 percent.

By contrast, the effective, composite cost-sharing rate would be much lower in this example. The federal government would pay an interest subsidy equal to $5.5 million for the irrigation purpose--the discounted present value of a 50-year loan of $8 million at a real interest rate of 6 percent. In addition, the federal government would pay the fish and wildlife cost of $3 million for a total effective federal contribution of $8.5 million. Nonfederal costs include the present value of irrigation payments without interest, M&I payments with interest, and all O&M payments. These total $7.1 million.

Effective, composite cost-sharing rates were calculated using this methodology for almost 4,800 joint federal and state water projects based on a 6 percent discount rate and a project life of 50 years (see Table 4). 5/ For all types of water projects, the mean, nonfederal effective, composite cost share is 30 percent; or over the average life of a given water project, the federal government pays 70 percent of all costs and the nonfederal participants pay 30 percent. Nonfederal participants pay the least for navigation projects--7 percent of total project costs; and they pay the most for hydroelectric and municipal water supply projects--64 percent in each case.

Comparing Nominal and Effective Capital Cost Sharing

Effective nonfederal shares of capital costs are generally lower than nominal shares because of long repayment periods with fixed interest rates that tend to be low relative to the government cost of capital, provisions for interest-free "start up" periods, forgiveness of interest entirely during repayment, or the transference of cost from a reimbursable purpose to a nonreimbursable purpose (see Table 5). Low effective nonfederal cost-sharing rates imply a large federal financial responsibility and, potentially, federal subsidies. Large disparities between nominal and effective cost-sharing rates could indicate a cost-sharing outcome different from that originally intended by the Congress. For example, cost sharing for both inland navigation and irrigation projects involves substantial federal subsidies, but the nominal rate for navigation projects is close to the effective rate. The nominal nonfederal share of building a Corps' irrigation project is 50 percent while the effective share is only 15 percent. Most of this subsidy results from three practices: basing capital repayment terms on a calculation of ability to pay rather the actual cost of service; allowing other beneficiaries (hydropower or municipal water users) to pay irrigation costs, thus creating a cross-subsidy; and forgiving entirely the interest on federal capital outlays. These practices were not the original intent of the 1902 Reclamation Act; rather, they have been added in subsequent legislation.

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5. Although cost-sharing rates were calculated on the basis of 1974 data, no new projects have been authorized since 1976 and no new cost-sharing arrangements have been established. Only the effect of using a different interest rate would change these calculations if made today. A higher interest rate would have the effect of decreasing the nonfederal share of most types of projects. See U.S. Water Resources Council, Options for Cost Sharing--Part 5A, Planning and Cost Sharing Policy Options for Water and Related Land Programs (November 1975).

TABLE 4. NONFEDERAL MEAN, EFFECTIVE, COMPOSITE COST SHARING FOR THE CORPS, BUREAU, AND SCS, BY PROJECT PURPOSE (In Percents)

Project Purpose	Nonfederal Mean, Effective, Composite Share			
	Corps	Bureau	SCS	20 Agencies
Urban Flood Damage Reduction	17	a/	a/	20
Rural Flood Damage Reduction	7	10	27	11
Drainage	35	b/	58	46
Irrigation	19	18	54	19
Erosion Control	5	b/	89	34
Municipal and Industrial Supply	54	71	100	64
Water Quality Control	3	82	b/	60
Fish and Wildlife Preservation	11	13	57	14
General Recreation	17	18	63	19
Commercial Harbors	16	b/	b/	16
Inland Navigation c/	6	7	b/	6
Hydroelectric Power	61	65	b/	64
Agency Mean	20	37	49	30

SOURCE: U.S. Water Resouces Council, Options for Cost Sharing--Part 5A, Planning and Cost Sharing Policy Options for Water and Related Land Programs (November 1975).

a. Agency reported a cost category for this purpose but did not report cost sharing.
b. No activity reported for this purpose.
c. Receipts from the fuel tax implemented pursuant to the Inland Waterway Revenue Act of 1978 are not included; therefore estimates may be slightly low.

TABLE 5. A COMPARISON OF AVERAGE NOMINAL AND EFFECTIVE NONFEDERAL CAPITAL COST-SHARING RATES, BY PROJECT PURPOSE (In percents) a/

Project Purpose	Corps		Bureau		SCS	
	Nominal	Effective	Nominal	Effective	Nominal	Effective
Urban Flood Damage Reduction	0-20	14	b/	b/	19	15
Rural Flood Damage Reduction	0-20	5	0-20	0	0-20	19
Drainage	50	30	b/	b/	50	52
Irrigation	50	15	0-20	10	50	48
Municipal and Industrial Supply	100	54	100	68	50	100
Water Quality Control	0	0	25	99	b/	b/
Fish and Wildlife Preservation	0-25	7	25	4	50	51
General Recreation	0-50	14	50	11	50	58
Commercial Harbors	0	16	b/	b/	b/	b/
Inland Navigation	0	6	b/	b/	b/	b/
Hydroelectric Power	100	63	100	63	b/	b/
Agency Average	25	18	89	31	43	43

SOURCE: U.S. Water Resources Council, Options for Cost Sharing--Part 5A, Planning and Cost Sharing Policy Options for Water and Related Land Programs (November 1975).

a. Average values are weighted within purposes by allocated cost.

b. No activity for this purpose.

Both the hydroelectric power and municipal and industrial water supply purposes have large disparities between nominal and effective cost-sharing rates. Stated policy for federal water resources cost sharing for these two purposes calls for full recovery of all capital and operating costs through the sale of vendible products. 6/ High nominal nonfederal cost-sharing rates attest to this. After compensating for interest rate and repayment period subsidies, however, the actual result is a rather large federal subsidy--38 percent in the case of municipal and industrial water supply and 36 percent for hydroelectric power development.

Effective nonfederal capital shares are sometimes greater than nominal shares (for example, Corps inland navigation projects or SCS recreation projects). This is because the cash value of land easements and rights-of-way allocated to these purposes can account for up to 20 percent of overall project capital costs. In general, total nominal and effective operation and maintenance cost-sharing rates are equivalent because the nonfederal participants either pay all operation expenses on a cash, pay-as-you-go basis (irrigation projects, for example) or they pay none of these costs (as in large flood control reservoirs or navigation projects).

FEDERAL WATER PROJECT DECISIONMAKING

Historical Development

Early in the history of federal water resources development, the need for an efficient decisionmaking process was less acute, since needs were large and the costs of the water projects were considered small relative to the development benefits they produced. But over time, as the major water projects were completed and the federal water agencies began to explore marginal development projects, it became apparent that some measure of preference was needed to select the best water projects. So the Congress, in the Flood Control Act of 1936, introduced a benefit/cost standard for evaluating water development proposals. The act stated: ". . . the benefits to whomsoever they may accrue (must be) in excess of the estimated costs." For almost 30 years, the federal water agencies individually developed methods to calculate costs and benefits of water projects; there was little

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6. For additional details, see U.S. Army Corps of Engineers, Digest of Water Resources Policies and Authorities (March 27, 1981); and U.S. Bureau of Reclamation, Reclamation Instructions, Part 116, Economic Investigations.

coordination and even less consensus over appropriate analyses or economic assumptions. In the late 1970s, this effort was finally coordinated by the U.S. Water Resources Council, which issued a set of standards for evaluating costs and benefits of a proposed water project. 7/ These standards were never fully incorporated into federal water planning procedures, however. In 1983, the "Principles and Standards" were replaced by nonbinding "Principles and Guidelines" that emphasize project evaluation based on national economic benefits.

The result of such an evaluation is a benefit/cost ratio (B/C), used by the Congress to confirm the economic integrity of a proposed project. For reasons that are discussed in Chapter IV, however, a benefit/cost ratio is a relatively blunt instrument for separating more economic from less economic projects. As a result, federal funding often depends more upon the outcome of prolonged Congressional bargaining than on a project's economic merits.

A Multistep Decision Process

The process for evaluating and selecting water projects is lengthy and complex, involving approval of several offices in an executive agency, at least three trips to the Office of Management and Budget (OMB) and to Congressional committees for further approval, an act of Congress in most cases, and a Presidential signature. 8/ The average time between project evaluation and the end of construction is 26 to 28 years. The three most important steps of this process are: preparation of the feasibility report, project authorization, and project appropriations.

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7. Between 1979 and 1981, the Water Resources Council published sections of "Principles, Standards, and Procedures for Planning Water and Related Land Resources," commonly called the P&S. Methods were developed to quantify national and regional economic development benefits of water projects. In addition, the P&S outlined procedures to evaluate environmental quality benefits and other social effects.

8. For a detailed account of the process as it applies to the major federal agencies, see Gerald E. Galloway, Jr., Impediments in the Process for Development of Federal Water Resources Projects: Why All the Delay and What Can We Do About It? (prepared for the U.S. Water Resources Council, September 1981).

The Feasibility Report. At full cost to the federal government and at the request of a local sponsor (state or local government), field offices of the federal water agencies undertake a feasibility study to examine a potential water project from engineering, environmental, and benefit/cost perspectives. If the evaluation suggests a feasible engineering solution, without objectionable environmental problems, that will yield benefits in excess of costs, the project is presented to the Congress for construction authorization. 9/ During this process, coordination with state and local officials is encouraged, but the federal agencies solicit relatively little direct input. A project's benefit/cost ratio is calculated at this stage.

Project Authorization. The Congress examines all this information, and if, in its judgment, the project has been evaluated fairly and appears to be in the national interest, it becomes one of a number of such projects contained in a water project authorization bill. Historically, there has been such a bill about every two years since the turn of the century, although the last authorization act was passed in 1976. A benefit/cost ratio of less than one will prevent a project from proceeding to the authorization step. But critics of this process insist that a B/C greater than one is not difficult to show because of the uncertainty inherent in procedures used to calculate project benefits.

Project Appropriation. It is relatively easy to authorize a water project because no funds are committed to its construction until the third major step--project appropriations. Each year, the federal water agencies submit their budgets for Congressional approval, including the agency's recommended spending on water projects. The pivotal decisions on federal spending are made at this stage. Based on OMB and agency recommendations, certain projects are selected for funding each year while others are not. Many more projects are authorized than the number chosen for yearly appropriations, creating a backlog of authorized but unfunded projects. In fiscal year 1982, for example, no request for appropriations was made for over 250 authorized, ongoing Corps projects. Another 362 authorized Corps projects had been deferred or were considered inactive. Once a potential project has progressed to the appropriations stage, economic selection criteria become much less important in guiding the choice of projects. Funding decisions generally follow highly charged Congressional debate.

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9. The Office of Management and Budget is responsible for screening project feasibility reports prior to authorization. All Congressional action is at the committee level until an authorization or appropriations bill is presented to the entire Congress. Different committees handle the affairs of different federal water agencies.

CHAPTER III. SHIFTING WATER DEVELOPMENT PRIORITIES

Over the last 150 years, the federal role in water project decision-making and financing has evolved primarily out of a concern for the objectives of an expanding industrial and agricultural economy. These objectives have included: stimulating regional economic growth (inland navigation, irrigation, hydropower); providing for the national defense (ports and harbors); and creating aesthetic or nonmarketable benefits (flood control, water quality, fish and wildlife preservation). To be sure, these are still valid objectives for federal investment in some new water projects. But most of the federally important water projects are now in place, to a large degree satisfying the economic development objectives that have guided past policies. As a result, emerging water development priorities are shifting away from large interstate projects toward local development, rehabilitation, and efficient management of existing water projects. This trend suggests a much stronger role for economic efficiency as a guiding principle in public investments.

SHIFTS IN FEDERAL SPENDING

The days of huge federal outlays for equally large water projects appear to be over. In real terms, appropriations for water project construction under the four federal water agencies have declined by almost 80 percent over the last 16 years, from about $6 billion in fiscal year 1968 to $1.3 billion in fiscal year 1984 (see Figure 1). Major river basins--the Ohio, Mississippi, Missouri, and Colorado, to name only a few--have been improved to provide flood control, navigation, and hydropower.

By contrast, federal spending for operation, maintenance, and rehabilitation (OM&R) of existing facilities has increased. Since 1968, the combined OM&R appropriations for the Corps, the Bureau, and the TVA have increased by 38 percent in real terms. As a percentage of new construction appropriations, OM&R appropriations have increased from 23 percent in 1968 to over 100 percent in 1984 (see Figure 2). For the first year in history, the Corps' budget request for operation and maintenance for fiscal year 1984 is larger than its budget request for construction.

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Figure 1.

Combined Appropriations for Water Project Construction by the Corps of Engineers, Bureau of Reclamation, Soil Conservation Service, and Tennessee Valley Authority

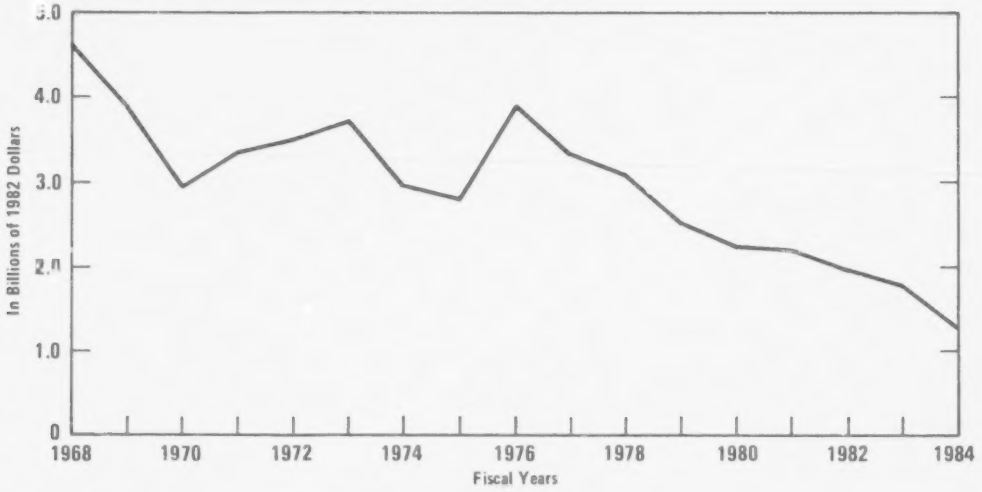
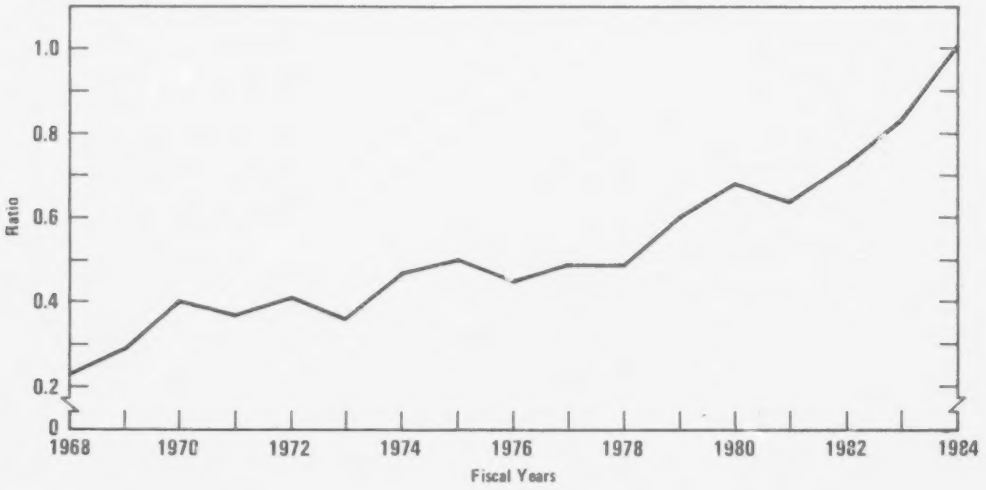


Figure 2.

Ratio of Combined Operation, Maintenance, and Rehabilitation Appropriations to New Construction Appropriations of the Corps of Engineers, Bureau of Reclamation, and Tennessee Valley Authority



REALIZATION OF ECONOMIC DEVELOPMENT GOALS

The principal federal water resources programs were authorized in the early part of this century in response to emerging national development needs. But over the last half century, many of the development goals have changed markedly. One of the best examples is the irrigation program administered by the Bureau of Reclamation. Conceived at the turn of the century, the Bureau's mission was to help settle the West by subsidizing the construction of irrigation works and thus the price of irrigation water for family farmers. For the average federal dollar invested in building irrigation projects, all nonfederal interests combined invest only 11 cents. Today, western agriculture is a mature industry, due in part to 80 years of building subsidized irrigation projects. Western lands have indeed been settled over the past 80 years--in some areas, excessively so. Under water resource constraints, some western states, notably Arizona and California, are actively exploring ways to transfer agricultural water rights to more valued uses (primarily municipal drinking water).

Navigation projects provide yet another example of goals that have changed. The mission of the Corps of Engineers in 1826 involved developing the nation's waterways to provide a link for commerce between older U.S. cities (the major domestic centers of consumption) and the developing agricultural and industrial regions of the Midwest. As agriculture and industry moved west, development of inland waterways followed. Today, most agricultural and industrial regions are served by inland waterways, railroads, interstate highways, and oil and gas pipelines. But the federal government still pays for 94 percent of all lock and dam construction, dredging, and operation costs associated with maintaining the waterways. The historical policy basis for a subsidized system of waterways has been eroded by the development of highly competitive alternative means of transport. The problem is no longer one of developing the only practicable means of transporting goods but of maintaining the most efficient transportation network to serve the needs of the entire nation. 1/

SHIFTS TOWARD LOCAL PROJECTS

In part, federal interest in developing the nation's water resources grew out of a need to facilitate interstate commerce with a system of

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1. National Water Commission, New Directions in U.S. Water Policy, Final Report, Summary, Conclusions, and Recommendations (June 28, 1973).

inland waterways and ports and harbors. Today, these facilities are in place to the extent that they are economically justified relative to other competing modes of interstate transport. Future navigation needs will be primarily rehabilitation and maintenance of existing works. 2/ Federal activities in flood control, irrigation, and hydropower originated as single-purpose solutions to localized water development needs. But in the 1930s, with the advent of the river basin planning concept, these and other federal water development proposals were combined into major multipurpose interstate projects. Like the development of any natural resource, the most favorable sites were developed first. For example, under the TVA, the Tennessee River Basin's interstate water resources potential has largely been developed over the past 50 years. Similarly, a series of five large multipurpose reservoirs on the Missouri River mainstem already provide interstate flood control, irrigation, navigation, and other benefits to nine states.

Most analysts would now agree that the majority of large multipurpose projects that appear capable of meeting economic and environmental standards have already been built. For example, out of ten new projects recommended for funding in 1983 by the Bureau of Reclamation, four were for rehabilitation and maintenance of existing irrigation systems, four were for local irrigation construction, and two were for upgrading hydroelectric facilities at existing dams. Of nine projects proposed by the Corps of Engineers as new starts in 1983, four were local flood control projects designed to protect urban areas and three were hydroelectric projects with 100 percent local financing. In the Water Resources Council's first assessment of the nation's water resources in 1968, it was estimated that annual nationwide flood losses would total about $5 billion by 2020, and that three-fifths of these losses would occur in small upstream communities. Protecting these communities involves local flood control measures. Many downstream communities were considered protected by major flood control dams already constructed by the Corps of Engineers.

GROWTH IN STATE AND LOCAL CAPABILITIES

Many federal water development programs were conceived at a time when state and local governments were considerably less sophisticated than they are today. At the time that these programs were conceived, primarily over the three decades between 1930 and 1960, state and local government

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2. See U.S. Army Corps of Engineers, Institute for Water Resources, National Waterways Study--A Framework For Decisionmaking--A Summary (January 1983).

staffs were smaller in number, less well-trained in technical areas, and generally less able to manage complex water resource development projects. In addition, there was less interstate communication and a much lower level of state spending for water resources than there is currently. Between 1960 and 1980, the number of state and local water resources employees increased from about 70,000 to about 115,000, or a 64 percent increase, while the number of federal employees has remained constant. State and local general expenditures for all water resources purposes increased from $89 per capita ($16 billion total) in fiscal year 1960 to $111 per capita ($25 billion total) in 1980 (in 1982 dollars). 3/ The number of interstate water planning and management organizations more than doubled since 1960. 4/

State and local capabilities to finance water resources development have also matured considerably over the past 20 years. State bonding activity has increased seven-fold since 1959. In the state of New Jersey alone, over $1 billion in water resources bonds have been issued since 1969. Over the three-year period 1980-1982, the fifty states combined issued almost $8 billion in water resources general obligation and revenue bonds. 5/

In response to the continuing decline in federally funded water development, many states have created new state water development programs or have stepped up ongoing programs. In Florida, recently created Water Management Districts are authorized to levy ad valorem taxes in order to finance local water projects. They also have created local water supply capital funds from a recently imposed real estate transfer tax. Newly created demand for water resources services will be financed by incoming residents under this program. In Montana, a water development

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3. Calculated from unpublished data provided by the U.S. Bureau of the Census. Partial information may be obtained from two of their annual publications, Government Finances and Public Employment.

4. The proliferation of interstate organizations resulted in part from the Water Resources Planning Act of 1965 and activities funded through the U.S. Water Resources Council, created by that act. In 1982, when most of the activities of this agency and its staff were eliminated, funding for many interstate water planning agencies was abolished. While some interstate groups have reorganized to continue their work, the future of others is in question.

5. For additional details, see U.S. Congressional Budget Office, Current Cost-Sharing and Financing Policies for Federal and State Water Resources Development (July 1983).

fund was created in 1981 to make loans and grants to individuals and substate groups for all water development purposes. The fund is financed from mineral royalties and a portion of the state coal severance tax. In Pennsylvania, $300 million in general obligation bonds were sold in 1982 to make public water supply loans to local jurisdictions from a special public water supply loan fund. These are only a few examples of the states' growing financial capabilities. In all, 32 states now bond at the state level for water development; 26 states dedicate portions of some state taxes or collect user fees to finance water resources development; 33 states have water development loan and grant programs; and 29 states have established some form of special fund to support new water development.

CHAPTER IV. ECONOMIC EFFICIENCY AND WATER RESOURCES INVESTMENTS

Throughout the history of federal water resources development, efficiency of public investment has been recognized as one basic objective. It has not been the only objective, however, and rarely has it been the dominant concern. Water projects have been undertaken for economic, social, military, or political purposes. When these latter objectives guide investment decisions, often the result is a smaller net economic gain than otherwise would be available. Inefficient public investments cause national income to be smaller than it would be if conditions of maximum economic efficiency were to prevail. 1/ To the extent that economic efficiency becomes a major objective of water resource investment, the methods by which water projects are evaluated, financed, and ultimately paid for would require reexamination.

This chapter begins by defining economic efficiency as it applies to water projects. It then sets out guidelines for rethinking project selection, cost sharing, and financing policies directed at greater public investment efficiency. Chapter V identifies alternative water resource policies that could lead to greater efficiency and assesses their advantages and disadvantages.

ECONOMIC EFFICIENCY

Definition

Economic efficiency is an objective of investment decisionmaking that can be used to select among alternative water project designs (or indeed, between building a project or not). A water project is considered efficient if the dollar value of benefits to the economy flowing from the project is

1. For a thorough treatment of economic efficiency and water resources development, see John V. Krutilla and Otto Eckstein, Multiple Purpose River Development, (Baltimore, Md.: Johns Hopkins Press, 1958, published for Resources for the Future).

greater than the dollar value of goods forgone by individuals in order to construct and operate the project. Thus, when a water resources investment is guided by economic efficiency, the result is increased total national income. A water project's relative efficiency can be enhanced by altering its size, composition, or timing so that project benefits increase without incurring additional costs.

One way to evaluate a water project's "benefits to the economy" is to add all users' willingness to pay for the marketable benefits to some other measure of the value of the nonmarketable benefits. In an irrigation project, for example, a farmer should be willing to pay for irrigation water so long as his increase in income from irrigating is greater than his increase in production costs resulting from irrigation (including the added costs for water delivery, distribution, and irrigation equipment). Evaluation of nonmarketable benefits is sometimes more difficult. Individuals (or public entities) may not be willing to pay very much for public goods available to others even though by some other measure, these benefits are worth more to "society" collectively than they cost to produce. Flood control benefits, for example, can be evaluated on the basis of damages prevented even though private parties may not be willing to pay for protection. 2/

In this paper, changes in cost-sharing conventions and administrative processes are aimed at distinguishing efficient water projects (or levels of development of a given project) from inefficient projects. Assessing the relative efficiencies of competing projects can also help decisionmakers choose those projects with the greatest returns to the national economy, subject to fulfilling other policy goals. It is the former objective--simply distinguishing efficient projects from inefficient ones--that is of primary concern here. The latter objective--choosing among efficient projects--is important for proper resource allocation, but may have undesirable distributive effects among regions or may conflict with the pursuit of other social or political goals. Nonetheless, choosing among efficient projects is an appropriate longer-term goal of water policy reform.

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2. Market imperfections are discussed in more detail elsewhere in this paper. For a more complete discussion of economic efficiency in water resources development, see Arthur Maass, et al., Design of Water Resource Systems (Cambridge, MA: Harvard University Press, 1962); and Otto Eckstein, Water-Resource Development, The Economics of Project Evaluation (Harvard University Press, 1958).

Efficiency and Market Imperfections

The efficiency of committing scarce resources to the production of water resources benefits could be evaluated easily if all these benefits were derived through a market at prices determined by supply and demand interactions. This is seldom the case, however. For example, there is no ready market for selling flood protection. A system of levees providing flood protection to one member of the community will provide protection to the entire community. Thus, any member could choose not to pay on the chance that the contribution of others would be sufficient, which in turn would make other members reluctant to pay because their share could increase accordingly. Protection cannot be denied an individual who refuses to pay without simultaneously denying protection to all those who are willing to pay. This "free rider" problem can lead to underinvestment in public goods like flood control. Private enterprise, for example, would be unwilling to build flood control structures in the absence of firm contracts to guarantee payment, even though the cost of building flood control works could be far less than the collective community flood damages they would prevent. Conventional markets, therefore, are inadequate to ensure efficient resource allocation to flood control. 3/

This implies a role for public entities in the provision of nonmarketable water resources benefits. But public provision of water resources benefits does not necessarily mean that economic efficiency must be sacrificed. Beneficiaries' willingness to pay for nonmarketable benefits can be approximated (as if a market existed) and the costs of providing them can be identified. For example, flood prevention benefits would equal the aggregate cost of repairing flood damages and avoiding the inconveniences associated with flooding. 4/ Flood control costs are calculated like any

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3. Similar arguments describe market failures for other water resources benefits, including water quality, fish and wildlife maintenance, instream flow maintenance, and others. For additional detail, see Krutilla and Eckstein, Multiple Purpose River Development.

4. More precisely, benefits include the cost of restoring private and public land and structures to preflood conditions; loss of net farm revenue due to inundation; commercial losses; indirect losses, such as cessation of production, loss of wages and other income; and the cost of evacuation, emergency work, or flood relief. In practice, these benefits are calculated by subtracting annual flood losses with the project from those without the project. Since the incidence of flooding is probabilistic, benefits represent average annual changes in

other water resources investment--the value of land, labor, and materials committed to construction, operation, and maintenance of the project.

Therefore, while market imperfections do exist in the provision of many water resources benefits, economic efficiency can still help guide these investments. Like marketable benefits, such as hydroelectric power or municipal water supply, the application of an efficiency criterion to the provision of nonmarketable benefits has certain implications for cost-sharing and administrative processes.

ECONOMIC EFFICIENCY AND COST-SHARING POLICY

There are three parties to cost-sharing arrangements for water resource investments: the federal government, state and local governments, and private beneficiaries. The economic issue is whether a different division of cost than now exists would lead to greater efficiency. There is much evidence to suggest that efficiency would be improved if the federal government bore a lower share of the cost than it does under current policy.

The Basis for Federal Sharing of Water Development Costs

The federal government bears a portion of the cost of water projects for two reasons. First, in order to stimulate economic development or induce certain economic activities, the federal government has assumed a large part of the cost that direct users would otherwise pay. Examples include the federal subsidy intentionally built into irrigation or navigation cost-sharing policies. Perhaps less intentional subsidies characterize federal policy for hydroelectric power and municipal and industrial water supply projects.

Second, the federal government has traditionally provided nonmarketable, water-related benefits that the private market would not otherwise provide. The interstate nature of past water projects--multireservoir flood control systems, for example--is one reason why these costs have been borne primarily by the federal government as opposed to state or local govern-

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4. Continued
losses, assuming constant flood probablities and a reliable relationship between flood intensity and damages incurred. For additional details, see Otto Eckstein, Water Resource Development--The Economics of Project Evaluation.

ments. 5/ In addition, until relatively recently, state and local governments were not well-equipped technically or financially to undertake complex capital-intensive water development projects. Federal provision of flood control projects originated in the 1860s after a series of devastating floods in the lower Mississippi Valley. Local protection efforts were ineffective and the multistate protection plan envisioned by the Corps of Engineers was beyond the financial capability of the states. A national sense of urgency was, in large part, responsible for federal assumption of flood control costs.

How High Federal Cost Shares Promote Inefficiencies

A water development project often provides benefits directly to users (for example, water supply and hydroelectric power) or to the public in the general area of the project (such as prevention of flood damage to an entire river basin). When either group pays only a small portion of a water project's cost, the benefits they receive are, in effect, subsidized, thereby providing an incentive to demand more or larger projects than they might be willing to pay for if their own money was involved. This can cause public overinvestment and poor allocation of resources. Every public dollar invested in a questionable water project is a dollar that cannot be invested in some other productive economic capacity. Federal projects for irrigation and navigation, for which users do not bear their proportion of the costs, provide two examples.

Irrigation. Western farmers pay an average of only 19 percent of the cost of providing federally developed irrigation water, resulting from a 1902 federal policy to subsidize western settlement. The intent of the 1902 Reclamation Act was to stimulate small, private farming (160 acres or less per farm) within the largely unsettled western states by allowing repayment of federal construction costs, without interest and over a ten-year period. Repayment and acreage terms have become more liberal while real interest

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5. Water projects with interstate implications may justify federal coordination but not necessarily federal assumption of costs. In the case of interstate spillovers, some federal funding can be effective to induce states to build the "socially optimal" project size rather than, perhaps, a smaller project that would benefit only a single state. This argument, however, seems more persuasive in the case of water quality control, in which the federal government provides a large portion of sewage treatment plant capital costs to induce a higher level of pollution control than localities acting on their own behalf might wish to pay for.

rates have risen over the years, maintaining a subsidy to western agricultural interests and resulting in inefficient public investment. 6/

Long after the policy goals of the 1902 Act were achieved (the West is largely developed to the extent dictated by resource constraints), federal subsidies have led to the construction of irrigation projects long before they may be needed, and to the reclamation of lands at per acre costs far in excess of the value of the land after the project is completed. 7/ Because farmers pay such a small share of the real cost of irrigation water, they actively promote more and larger projects than they otherwise would. Federal subsidies for irrigation charge general taxpayers for building projects that small groups of beneficiaries would be unwilling to pay for, if they were assessed their full cost. Furthermore, high federal cost shares, resulting in artifically inexpensive irrigation water, provide farmers with little incentive for efficient use of that resource and allow the cultivation of water-intensive crops that would not be grown if water was priced at the cost of providing it.

Navigation. In the early 1800s, the Congress directed the Corps of Engineers to construct inland waterways and ports and harbors to serve emerging agricultural and industrial development in the South and West. Inland waterways were seen as the only means of transportation to link these regions to cities in the East. As development moved westward, so did federal construction of inland waterways. Federal port and harbor development was originally undertaken to facilitate overseas trade and to provide for the national defense. Today, the federal government pays 94 percent of the construction and operation costs of inland waterways and 84 percent of the cost of ports and harbors. 8/

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6. In 1939, The Reclamation Projects Act introduced the concept of "ability to pay," allowing farmers to repay a much smaller portion of construction costs over a 40-year period based on increased farm income resulting from the project. In 1982, the acreage limitation was liberalized to allow subsidies to farmers irrigating up to 960 acres.

7. See National Water Commission, New Directions in U.S. Water Policy, Summary, Conclusions, and Recommendations (1973), p. 168.

8 State and local government contribute necessary lands, easements, and rights-of-way which account for about 6 percent of the costs of inland navigation projects and 16 percent of ports and harbors. In addition, a small fuel tax is collected from users of inland waterways. For example, in 1981 the 6 cent per gallon tax raised $40 million in revenues, or about 6 percent of the 1981 combined federal capital and operating outlays for the inland waterways.

Times have changed, however, and facilitating regional development by providing subsidized waterways may no longer be in the national interest. What is in the national interest is ensuring the most cost-effective transportation system to serve the needs of the entire country. In 1980, federal subsidies covered more than one-fourth of the costs of all inland waterway shipping. This is more than four times the portion of shipping costs covered by rail subsidies and almost 30 times more than truck subsidies. 9/ Oil and gas pipelines, which compete directly with inland barges, receive no federal capital or operating subsidies. Thus, a federal cost-sharing policy providing subsidies encourages waterway investments that may not be cost-effective. 10/ Such a policy also diverts some traffic from railroads or trucks to waterways, because of lower, subsidized transportation costs which transfer proportionately more of the cost of freight from direct users to general taxpayers.

State and local governments may face a similar incentive for overconsumption if the benefits their jurisdictions enjoy are provided by the federal government at a subsidized rate. Availability of federal funds with low cost-sharing requirements from state or local governments can lead to federal construction of projects yielding primarily local benefits. When the cost of a local project is shifted from local beneficiaries to federal taxpayers, scarce federal resources are allocated to support local economic activity, displacing investments in other projects which may have a higher

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9. For additional details, see U.S. Congressional Budget Office, "Statement of Alice M. Rivlin, Director, before the Committee on the Budget of the U. S. Senate" (March 10, 1982), pp. 7-8.

10. Probably the best example of this is the Tennessee-Tombigbee waterway construction project. The project was originally evaluated in the 1940s and authorized by the Congress for construction by the Corps of Engineers in 1946 based on favorable economics perceived at that time. Because the project would bring economic opportunities to the region, at a very low local cost, local proponents successfully defended the project against formidable opposition until construction finally began in 1971. Based on the most recent calculations made by the Corps (1976), the project will yield $1.08 in navigation and other benefits for every $1.00 invested. In a 1981 review of the project, the General Accounting Office concluded that some 30 to 40 percent of the expected benefits will never materialize. If local proponents had been faced with paying the entire project cost, not 6 percent as under current policy, it is highly unlikely that they would have supported its construction at all. Competing rail or existing waterway routes would have provided a less expensive alternative.

national interest. Federal projects for flood control or municipal water supply provide two examples.

Flood Control. The federal government started to invest in flood control structures in the mid- to late-1800s as settlements in the lower Mississippi Valley began to experience devastating floods. Cost sharing for these projects was eventually formalized in the Flood Control Act of 1936, following severe flooding throughout the nation. Local beneficiaries were required to contribute necessary land, easements, and rights-of-way, as well as to maintain and operate structures after completion. But after two years of frustrated efforts at local coordination and continued severe flooding, local cost-sharing requirements for reservoirs were eliminated. In this context--a feeling of urgency, recognition of local coordination obstacles, and pressure for New Deal jobs programs--the current 100 percent federal share of costs for major flood control works was established. 11/

Although complete self-financing may never be realistic, as long as flood control projects are essentially free goods, communities will have an incentive to overstate their needs to influence the decisionmaking process and thereby receive projects. Moreover, local proponents will try to show that the benefits of flood control projects are larger rather than smaller in order to generate acceptable benefit/cost ratios. 12/ If the costs of flood control projects exceeds the development value of flood-free land, investments in such projects would be inefficient. Local proponents would have less motivation to overstate benefits if they were responsible for paying a larger share of a project's costs.

Experience has shown that recovery of flood control costs directly from beneficiaries is not feasible. Efficiency could be served, however, if local jurisdictions, acting collectively for their protected citizens, paid a higher proportion of the costs of federal flood control projects, perhaps by imposing an assessment on lands benefitting from flood control investments. A higher local share would help ensure state and local support for the most cost-effective flood control projects.

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11. Local participants in federal flood control projects classified as "local protection" are still required to contribute necessary land easements and rights-of-way that can range up to 20 percent of project capital costs. On average, for all Corps urban flood control projects, local participants pay 17 percent of total project costs. Local participants pay 7 percent on average of rural flood control project costs.

12. Otto Eckstein, Water Resource Development (1958), p. 154.

Municipal Water Supply. Under the Water Supply Act of 1958, the Corps and the Bureau may include municipal and industrial (M&I) water supply in multipurpose reservoirs, provided that they obtain reasonable assurance that such supplies are needed and will be paid for by local users within the life of the project. But under current Corps' cost-sharing conventions, if the water is never used, no repayment is required. Further, while federally developed M&I water lies unused waiting for demand to develop, the interest portion of construction costs plus all operation and maintenance allocated to the M&I purpose are paid by the federal government. The effect of this subsidy is to reduce the nominal nonfederal cost share of 100 percent for M&I water supply to an effective nonfederal share of only 64 percent. The Corps and the Bureau estimated in 1980 that together they have spent or will spend about $1.3 billion for authorized M&I supply. Even if all supplies eventually are used, the nonfederal share will repay only $800 million of that investment, based on the historic effective nonfederal share for M&I supply. 13/ Further, in a 1978 survey of seven Bureau reservoirs that had reserved industrial water supplies, 96 percent of the reserved supply was not used by potential industrial customers--only four percent of the total supply available was delivered, and the Bureau did not expect to deliver more than that in the near future. 14/

The original intent of the 1958 act was to provide M&I water in the most efficient manner; the economies of scale in many large federal multipurpose developments allow the development of M&I water at a lower cost than could otherwise be achieved. To make this water available to municipalities and to industry at cost would be both efficient and in the national interest. But to provide this commodity at federally subsidized prices transfers the cost from direct beneficiaries to the general taxpayer. Furthermore, low prices promote wasteful use of water once it is delivered. Unused M&I water ties up scarce federal resources, preventing their commitment toward productive economic activity in other uses.

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13. For additional details regarding the Corps' and Bureau's role in providing municipal and industrial water, see U.S. General Accounting Office, Contracts to Provide Space in Federal Reservoirs for Future Water Supplies Should be More Flexible (May 16, 1980).

14. See U.S. General Accounting Office, Water Supply Should Not Be An Obstacle to Meeting Energy Development Goals (January 24, 1980).

Efficiency-Motivated Changes to Current Cost-Sharing Policy

With the above examples in mind, changes in current cost-sharing policies can be formalized, based upon marketability of project benefits. First, marketable water project benefits would be separated from those that are nonmarketable. Second, regardless of who finances a water project (a separate question from who pays, which is addressed in the next chapter), systems of user fees would be devised to recoup the cost of providing marketable benefits from direct beneficiaries or small groups of users. Finally, the cost of providing nonmarketable benefits would be shared between the federal government and state and local governments when applicable. In order to accomplish the above steps, two sets of criteria are needed: one that separates marketable from nonmarketable benefits, and a second that allocates nonmarketable benefits among the appropriate public entities.

Marketability of Benefits. All water project benefits can be classified as marketable or nonmarketable based on three factors: how benefits are supplied to users or beneficiaries, the cost of marketing, and the ability to distinguish between direct users and the general public. Marketable benefits include municipal, industrial, and agricultural water supply; inland navigation; harbor improvement; hydroelectric power; recreation; erosion control; and drainage. Nonmarketable benefits include fish and wildlife enhancement, water quality, flood control, area redevelopment, and preservation of historic sites and natural or ecological systems. 15/

Hydroelectric power and municipal, agricultural, and industrial water supplies are easily marketed benefits that may be supplied on a unit basis and priced at market or cost-of-service rates for readily identifiable groups of users. Both water and electricity may be purchased in discrete units (gallons or kilowatt-hours, respectively). Marketing costs are generally low and users are easily singled out from nonusers. Most recreation, inland navigation, and harbor improvement benefits are also marketable through a

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15. Apportioning all water resources benefits into two categories is, perhaps, simplistic considering the diversity of benefits and the criteria that determine marketability. For an interesting discourse on the marketablility of water benefits based on public market failure, see David J. Allee, "Failure of the Public Market--a Framework for Cost Sharing Policy Research," in Ronald M. North and Steven H. Hanke, eds., Financing Water Resources: Cost Allocation, Cost Sharing, Incentives (The University of Georgia, June 1982).

system of user fees to recover allocated costs. 16/ Although these benefits may not be purchased one unit at a time, they may be valued and priced according to use by an easily separated group of users. Inland navigation benefits are probably more efficiently marketed at the federal level because the inland waterway system operates as an interstate transportation network. Systems to recoup the cost of providing these benefits could incur limited administrative costs, but revenue collected would far exceed any overhead.

Erosion control and drainage benefits are considered slightly less marketable because they cannot be delivered on a unit supply basis and cost-recovery systems may be slightly more complex. 17/ Nevertheless, users are still identifiable and costs can be recovered relatively inexpensively through imposition of a value added tax, for example. Some types of erosion control benefits and all drainage benefits may be priced according to relative productivity gains, or at the value of beneficiaries' economic output with the project versus output without the project.

Another group of benefits--fish and wildlife enhancement, water quality, flood control, area redevelopment, and preservation of historic or cultural sites--are not easily marketed because administrative costs are high or market imperfections prevent isolation of beneficiaries. Partial recovery of fish and wildlife benefits may be possible through sales of hunting and fishing licenses, but revenues could sometimes fall short of administrative costs. Real estate tax assessments could recover some costs of urban and rural flood damage reduction, but valuation is difficult and

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16. There is no consensus on the correct way to separate navigation costs from total multipurpose project costs. The Corps of Engineers has devised a number of procedures that are applicable in different situations. Thus, while navigation benefits are marketable, some controversy surrounds separating these benefits from overall project benefits.

17. Erosion control and drainage projects transform previously unusable land into tillable acreage. For example, a drainage project entails construction of channels to drain a swamp and keep this low-lying area drained and usable for production. One type of erosion control project prevents loss of soil from agricultural land, thus allowing cultivation. Erosion control also is used to prevent beach erosion, which may not be marketable.

administrative costs might be high. 18/ Area redevelopment and preservation of historic site benefits might be vendible to concerned groups or associations, but no precedent for such a sale exists and legal or economic problems could arise.

Finally, current or future public goods are considered nonvendible. Such goods include stream flow regulation for aesthetic or ecological reasons, management of nonpoint source water quality (usually land management or forestry), and maintenance of natural areas and ecological systems. When these benefits are provided, the public in general is the beneficiary, not individuals or groups of users. Further, consumption of these benefits does not diminish future availability for other beneficiaries.

Sharing the Costs of Nonmarketable Benefits. Economic principles are perhaps less helpful in allocating the costs of public goods or other nonvendible benefits among the different levels of government. But there are practical considerations that might guide such a policy, including providing incentives to prevent under- and over-consumption, or ensuring equitable treatment of the fiscal capacities of state and local governments relative to each other and to the federal government. If the federal government paid all the costs of nonmarketable benefits, states would have an incentive to demand more water projects than if they had to pay a portion of each one. If the states paid all nonmarketable costs, some worthwhile projects might not be built. Either arrangement would imply that all nonmarketable benefits accrue to only one level of government. Sharing costs would help prevent under- and over-consumption while recognizing that all public entities have a stake in providing public goods.

In addition, not all states are equally able to afford such payments. In relation to federal fiscal capacity, individual states may be at a disadvantage. A marginally larger federal share in financing nonmarketable costs recognizes a stronger federal fiscal capacity--greater creditworthiness, lower interest rates on debt, greater ability to shift funding priorities, and the like. As the economic burden on states is reduced, state-to-state fiscal inequity becomes less important.

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18. For example, flood control districts in Wisconsin are authorized to levy flood damage reduction user fees to recover the cost of building and maintaining flood control works. So far, only one district has attempted to use its authority, and when beneficiaries were informed of the user fees they would have to pay, the project lost local support.

ECONOMIC EFFICIENCY AND ADMINISTRATIVE PROCESSES

Aside from the inefficiencies promoted by current cost-sharing conventions, the administrative processes by which water projects are evaluated, authorized, and funded are long and complex, often resulting in project delays as long as 28 years. 19/ Delays tie up productive resources for long periods, leaving water resources needs unmet in the field. In addition, the information used to select water projects is often not sufficient to ensure the economic viability of water projects once they are built. Local decisionmaking over water resources investments that yield mostly local benefits could reduce development delays and improve the project selection process. State and local input during benefit and cost evaluation, coupled with a priori knowledge that local benefits will be provided by local sources of funding, might yield more realistic assessments of overall project feasibility.

The Authorization and Appropriation Process

The process by which water development needs turn into public works in operation is quite long--up to 28 years, and at any step along the way, a project may be delayed or cancelled. 20/ For the smaller, more localized projects that are likely to dominate future water resources development, the current process can cause needless delays while water problems persist.

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19. See Gerald E. Galloway, Jr., Impediments in the Process for Development of Federal Water Resources Projects: Why All the Delay and What Can We Do About It? (prepared for the U.S. Water Resources Council, September 1981).

20. For 24 Bureau of Reclamation projects, the average time elapsed between the initial study and project operation is 28 years. For Corps of Engineers projects, average time between study authorization and project completion is about 26 years. SCS projects move considerably faster; they are generally completed within 15 years of initial study. For a detailed discussion of this issue, see Galloway, Impediments in the Process.

Since all the water agencies are similar in this respect, only the Corps of Engineers' procedure will be highlighted as an example. 21/

Once a water resources problem is recognized and the Congress approves a feasibility study, it takes, on average, 4.4 years for the Corps to receive an appropriation to pay for the study. The study itself takes about 4 years to complete, during which time an Environmental Impact Study is prepared. Review by the Corps, Office of Management and Budget (OMB), and the Congress of the feasibility report takes another 1.5 years on average. If approved by all reviewers, authorizing legislation must be passed by the full Congress and signed by the President. Once authorized, it takes an average of 11 years to obtain construction funding and design the final water project. Actual construction takes an average of 5.7 years, each of which requires another Corps' request for appropriations, approval by OMB, and appropriations by Congress.

Although this multistep process was designed to promote projects in the public interest and eliminate undesirable ones, more and more projects are simply being delayed, thus causing massive backlogs. For example, the Corps of Engineers has a backlog of over 400 authorized and active projects at various points in the process, which in aggregate would require about $36 billion to complete. Similarly, the Bureau has an authorized project backlog that would require $14 billion to complete. 22/

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21. Bureau and Corps projects are budgeted on a line-item basis while the SCS plans and builds projects from a general appropriation. Under a separate process, the Corps can build small water projects (up to $2 million depending on project type) without individual Congressional or Executive approval.

22. In a recent study, the General Accounting Office (GAO) estimated that the Corps and the Bureau had 934 authorized water projects needing about $60 billion to complete construction. Of these, 289 were funded in 1982; 257 were considered active, but did not receive funding in fiscal year 1982; and 388 were considered deferred or inactive. In order to complete the 289 projects actually funded in 1982, appropriations of $35 billion would be necessary in future years. The remaining 645 projects would require about $25 billion in future funding, although the GAO considered such funding to be uncertain. For additional information, see U.S. General Accounting Office, Water Project Construction Backlog--A Serious Problem With No Easy Solution (January 26, 1983).

While projects sit in line waiting for federal authorization or appropriations, water resources problems persist and the costs of meeting water needs can escalate with inflation. Further, while waiting for appropriations, the terms under which some projects were economically justified and authorized by the Congress can change considerably. For 46 active Corps projects and 17 active Bureau projects that were up to 25 percent complete in 1982, the average interest rate used to calculate costs and future benefits (when these projects were studied in the 1960s and 1970s) was 3.9 percent, compared to an interest rate around 9 percent that might conservatively be used for the same calculations today. Because total water project costs are dominated by capital-intensive construction costs in the early years and only yield benefits slowly over a 50-year project life, increasing real interest rates can put budgetary pressure on the federal government, the prime water project financier, and return eroded benefits over a very long period of time.

Screening Projects for Economic Efficiency

The Congress is responsible for authorizing feasibility studies, authorizing project construction, and appropriating funds annually for these two purposes. The benefit/cost ratio (B/C), developed during the feasibility study, serves as the economic screening process for the Congress, separating economically desirable projects from undesirable ones. As long as benefits exceed costs (a ratio greater than one), the Congress should find no economic reason to reject the project. But despite elaborate procedures to calculate benefits and costs, the science is inherently imprecise, so that projects reach the Congress for funding with an economic stamp of approval--a B/C greater than one--and yet with a highly imprecise evaluation of their economic merits. A second economic screening device--the willingness to pay of the beneficiaries--would provide better information to help guide the Congress in making water project investment decisions. 23/

Benefit/cost analyses are generally performed by field offices of the federal water agencies, the same offices responsible for constructing and sometimes operating and maintaining water projects. These agencies operate under a proconstruction mandate from the Congress that has slowly

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23. "Willingness to pay" encompasses more than just an expression of intent on the part of project beneficiaries. As used here, willingness to pay becomes operational when project beneficiaries either supply an up-front financing share of project costs or commit themselves to legally binding contracts for repayment of a share of project costs.

grown more powerful as the federal government has accepted a larger role in developing national resources. These agencies have become accustomed to building water projects, and their livelihood depends on continuing to do so. Therefore, it is in their best interests to describe project benefits generously and project costs frugally. Critics of this process claim that because of their vested interest in building water projects, federal water agencies do not produce impartial assessments of benefits and costs. 24/

Because local sponsors have such a low financial stake in water projects, they have no incentive to make sure costs and benefits are calculated accurately. Their proportion of the cost of making a mistake is very low in relation to the benefits they will receive if the water project is built. The Congress, in effect, underwrites such activity by accepting the financial consequences of understated costs and overstated benefits; high federal cost shares transfer such liability from project beneficiaries to the federal government and, ultimately, to the general taxpayers.

Efficiency-Motivated Procedural Reform

Two types of procedural reforms are suggested by the administrative inefficiencies that exist under current policy. First, complex, centralized decisionmaking over essentially intrastate water project decisions suggests that state or local governments should become more involved with choosing projects that yield mostly local benefits. Second, the imprecision resulting from strict reliance on benefit/cost analysis as an economic screening process suggests increasing state or local participation during project evaluation and relying more on willingness to pay as a measure of project benefits.

Use of Local Information. To the degree that water development priorities continue to follow the recent trend toward smaller, more localized projects, the use of local information in making investment decisions will become increasingly more important. In addition, cost recovery for vendible benefits of intrastate projects could be implemented more effectively at the level of government closest to the resources--the states.

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24. Numerous studies have concluded that the federal water agencies consistently overestimate benefits and underestimate costs. Perhaps the most thorough treatment is found in Robert Haveman, Water Resources Investment in the Public Interest (Vanderbilt University Press, Nashville, Tenn.: 1965). See also U.S. General Accounting Office, An Overview of Benefit-Cost Analysis (1978).

Recently, many states have recognized the importance of setting their own water development priorities. In response to reduced federal financing and a conflict between their water development goals and federal policy, the western states have recently made it quite clear that they are interested in developing and managing their resources according to their own priorities. Since the so-called "Sagebrush Rebellion" in 1980, states have begun to advance this position more forcefully and have taken legal and financial steps to ensure continued development of western water. Evidence of this includes the 1980 Arizona groundwater law, the California State Water Project and Peripheral Canal proposal, and general proliferation of state water development funds throughout the western states. 25/

Eastern and midwestern states have also recognized the shortcomings of a completely centralized federal approach to water development, and have recently called for a comprehensive review of national water policies. 26/ They have identified serious management failures and inequities in the distribution of federal water funds. Between 1956 and 1980, the northeastern and north central states received only about 25 percent of all federal water resources outlays. The southern states received almost 40 percent while the western states received about 35 percent. 27/ Such

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25. For example, in 1980 the Arizona legislature passed a comprehensive groundwater management and use act implementing, among other things, wellhead pumping taxes, strict water conservation measures, and substantial fines for over-pumping--in return for final funding of the Central Arizona Project that would bring about 2.2 million acre-feet of lower Colorado River water to the Phoenix and Tucson metropolitan areas each year. California has spent about $2.5 billion over the last 20 years to capture spring runoff from the mountains north of Sacramento and to transport water through the California Aqueduct to water-short cities to the south. If constucted, the 43-mile Peripheral Canal would link the Sacramento River north of the San Francisco delta region to the South Bay Aqueduct to ensure continued supply to Southern California once the Central Arizona Project begins to divert Colorado River Water from California to Arizona.

26. See Northeast-Midwest Institute, Building A Water Policy Consensus: Key Issues for the Eighties, Washington, D.C. (June 1982).

27. Congressional Research Service, Environment and Natural Resources Division, unpublished data developed at the request of the staff of the Senate Committee on Environment and Public Works (March 1982).

an imbalance, claim eastern and midwestern officials, has resulted in the neglect of the water supply needs of older population centers while the growth-induced or special interest water needs of other regions have been addressed.

Willingness to Pay. Benefit and cost analysis provides aggregate information about overall project benefits and costs. Willingness to pay goes one step further by assigning the costs of a project to those who directly benefit from it. Under this second economic screen, users or beneficiaries would have an incentive to support only those projects whose expected return was greater than what they would pay to acquire it. To the extent such a screening process was used, project support because of federal subsidies would be reduced. Water projects would no longer be viewed as windfall opportunities but rather as investments. Decisionmaking at any level would be improved if this type of information was provided. Simply instituting cost-recovery mechanisms (user fees for vendible benefits or special property assessments for some nonmarketable benefits) would go a long way toward applying willingness to pay as a means of benefit estimation. If those who would be asked to pay for a project were integrally involved during project planning, decisionmakers would be more assured of a firm commitment to pay.

CHAPTER V. POLICY OPTIONS

Congressional concern for efficient water resources investments is beginning to focus on three areas for possible reform: project cost sharing, selection, and financing. In order to effect improvements through reallocated cost sharing, two principles stand out: first, users should pay the cost of providing marketable benefits in proportion to their use; and second, public entities should share the costs of providing nonmarketable benefits in rough proportion to the accrual of these benefits. With regard to project selection, a larger role for state and local governments in the decisionmaking process would recognize the shift from interstate to intrastate water resources projects and the potentially larger cost share that these government levels should bear. Apart from the issue of who ultimately pays for water projects (expressed in cost-sharing policy), the issues of who should finance these activities and how they should be financed are chief concerns of the Congress and the states. The forms of financing and the burden of "up-front" capital requirements on each partner could have profound effects on the way water resources are developed.

This chapter analyzes three policy alternatives representative of recent Congressional proposals:

- A federal loan program,
- Federal block grants, and
- Federal project grants under a limited federal role.

Each option would place greater responsibility for project selection, financing, and repayment on states and local governments and on direct beneficiaries. This emphasis could provide a greater incentive than current policy to ensure that the most cost-effective projects are built and maintained, and to guarantee an equitable distribution of government services. This shift in responsibility would also affect federal, state, and local budgets, and the costs borne by private-sector beneficiaries of water resources projects.

FEDERAL LOAN PROGRAM

A federal loan program would provide both the cost-sharing incentives to promote investment efficiency and a source of development capital for all states. Evaluation and selection of nationally important projects would remain at the federal level, while projects of local importance would be chosen by states according to their own priorities.

A federal loan fund would be established from which local investments could be financed. The fund would require federal appropriations initially, but over time it would become self-sustaining as states paid back their loans. The states would choose among development and maintenance priorities and request that fund monies be allocated to the appropriate federal water agencies to undertake projects specified by the states. Project benefits would be divided into two categories: marketable and nonmarketable. The states would assume legal responsibility for repaying the costs of providing all marketable benefits and an appropriate share (perhaps 50 percent) of the nonmarketable benefits. States would be given full legal authority to establish user fees or other cost-recovery mechanisms when necessary to meet their repayment obligations. The states would manage these projects once they became operational.

Loan requests would be submitted by the state governor to a federal water development loan board for review. The board would be composed of representatives from the Corps, the Bureau, the TVA, and the SCS; state representatives, perhaps from the National Governor's Association; and members at large selected by the Congress based on their demonstrated expertise in water development. Loans could be disbursed on a first-come-first-served basis.

Federal, state, and local personnel could conduct joint feasibility studies with an expanded scope. The states and the federal government would share study costs equally. These studies could include engineering feasibility, environmental impact analysis, market analysis for marketable benefits, and benefit/cost calculations for nonmarketable benefits. Feasibility reports would be submitted to the appropriate state governors' offices and to the director of the main federal agency involved in the project. They could serve as the basis for a loan application, stating the overall and annual construction costs, a schedule of repayments corresponding to annual sales of marketable products, a schedule of repayments corresponding to the state share of nonmarketable costs, and a statement of annual federal costs corresponding to the federal share of nonmarketable costs. Interest rates on the remaining loan balance could be re-evaluated every five years.

Separately, the federal government would form partnerships with appropriate groups of states to finance and manage interstate water

resources systems (inland navigation or multireservoir flood control systems, for example). The federal government would finance new construction and operation of these projects, while the states would contribute any necessary land easements or rights-of-way. These systems would be managed by joint federal and state boards. The federal government would institute system-wide user fees when applicable to recover both construction and operation expenditures.

Economic Efficiency Under a Loan Program

A federal loan program could be a major step toward an efficient investment program for water resources. For both intrastate and interstate projects, beneficiaries would have to pay user fees to recover the cost of providing marketable benefits. The cost of providing nonmarketable benefits would be shared between the federal and state governments. If either user groups or the state judged the project to be uneconomic, the project would not go forward as planned. Either the project scope could be altered until benefits were perceived to be greater than costs or the project would be eliminated entirely, thus allowing the state and federal government to commit their resources elsewhere.

Because states would be financially responsible for repaying a much larger share of any project's cost than they now pay, those projects perceived by the state to have the highest net return on investment would be promoted first. The states would be responsible for repaying a minimum of 50 percent of any project's cost, even if all benefits were classified as nonmarketable. Compared to the current average nonfederal share of 30 percent, this represents almost a doubling of the financial responsibility of the states.

Moreover, the federal government would institute user fees to recover all costs associated with providing marketable benefits of interstate projects. Full-cost user fees would be established to recover the federal investment in new construction and annual operation and maintenance for inland waterway projects. To the extent that multistate flood control projects were still economically justified, they would be financed (and paid for) by the federal government. This arrangement, however, could continue to provide an incentive for states or beneficiaries of such projects to demand more or larger projects than they would if they were responsible for repayment.

Effects on the Federal Budget

In the early years of a loan fund, before state and user payments began to accrue, high loan demand could put budgetary pressure on the federal government. In time, however, state and user payments would actually reduce annual federal outlays for water projects. Federal outlays for construction of water projects totaled about $2 billion in fiscal year 1982; but this spending figure is low relative to a recent assessment of water resources needs. 1/ To meet the federal financing responsibility for interstate projects plus the state loan demand, federal capital outlays for all water projects initially could increase to over $4 billion a year. If federal capital was substituted for the state capital that now finances strictly state water development, demand for federal funds could increase to over $6 billion a year initially. The repayments from user fees and the states, however, would reduce these demands over time.

It is difficult to assess the number or types of projects that would lose local support if user fees were instituted, but some projects would certainly be cancelled. One recent study of the effects of full-cost user fees on inland waterway traffic estimated about a 20 percent reduction in demand. 2/ Similarly, a flood control project in Wisconsin was cancelled by local sponsors when citizens learned that real estate assessments would increase to pay for local flood protection. Bureau officials have concluded that demand for irrigation water would drop dramatically and some pending projects could be cancelled under a system of user fees to recover the full cost of service. 3/ If overall demand dropped by 30 percent, federal outlays in the early years of a loan program could be held to about $3 billion a year.

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1. A recent Congressional Budget Office estimate of water resources needs based on federal water agencies' assessments included an additional annual capital requirement of $400 million for inland waterways, $60 million for ports, $700 million for dam safety, and about $600 million for backlogged but authorized projects. In aggregate, annual capital needs could increase from the 1982 level of $2 billion to about $4.1 billion. This level of outlays would have to be maintained for at least ten years. See Congressional Budget Office, Public Works Infrastructure: Policy Considerations for the 1980s (April 1983).

2. U.S. Department of Transportation, Inland Waterway User Taxes and Charges (February 1982).

3. For additional details, see U.S. Department of the Interior, Bureau of Reclamation, Preliminary Regulatory Impact Analysis for 43 CFR 426 Acreage Limitation (April 1983), p. 38.

Effects on States

On balance, the states would probably gain more than they would lose under a loan program. Ultimately, states would be financially responsible (through administration of user fees and state payments) for a greater portion of project costs than under current policy. But they could build needed projects according to state priorities with very low requirements for initial capital formation. In the long run, economically efficient construction and operation of water resources infrastructure would result in strengthened state and local economies.

The loan program implicitly recognizes the competitive advantage that the federal government has over state or local governments in financing relatively expensive water projects. Federal borrowing power is greater at lower cost (because of the lower risk involved) than either state or local borrowing power. A loan program could, therefore, offer a wide range of repayment terms to states to accommodate a variety of financial capabilities at the state and local levels. In this respect, the federal loan program appears quite sensitive to state concerns. However, this must be balanced against the increased state burden of evaluating projects, establishing cost recovery systems, and managing projects once they are constructed. Although it is difficult to predict state loan demand and thus the regional distribution of federal funds, a loan program would allow all states to compete for federal resources on an equal footing, eliminating any regional biases resulting from current funding mechanisms.

Effects on Users

Users would pay the full cost of services for marketable benefits. This could represent significant increases in the prices currently paid for federally subsidized water and water project benefits. In turn, users would be induced to conserve water if possible or make other efficiency adjustments motivated by the real, unsubsidized price of water. For example, western farmers receiving subsidized irrigation water under current policy would pay eight times the subsidized price, on average, under a federal loan program. [4]

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4. This estimate assumes that farmers would be willing to pay this higher price. Many would probably not pay so much to irrigate and would revert to dry-land farming. For additional details, see U.S. Department of the Interior, Water and Power Resources Service, Acreage Limitation--Draft Environmental Impact Statement (March 16, 1981). When compared to the effective, composite nonfederal cost-sharing rate for irrigation projects--19 percent--a full cost recovery plan would increase farmers' irrigation costs by a factor of 5, on average.

Shippers on the inland waterways would pay an average of about 16 percent more under full-cost user fees. This could curtail traffic on some waterways. Shippers of soybeans and grain (accounting for about 10 percent of all barge tonnage) would pay about 6 cents per bushel more, most of which would probably be passed back to farmers in the form of reduced prices paid for grain. The cost of shipping coal (accounting for roughly 25 percent of all tonnage shipped on the waterways) would also increase, ultimately raising consumers' electricity bills by about 1 percent.

Shippers using the nation's ports and harbors would also pay more under average user fees set to recover 100 percent of operation and maintenance costs. International shippers would pay about 40 cents per ton more than they now pay, or a 1 percent increase in total shipping costs. Great Lakes shipping costs would increase by about 19 percent and coastal shipping costs by about 7 percent. If users were also charged for new capital projects, costs could increase slightly more. For example, deepening the port of Norfolk would increase user fees by about $1.00 per ton of coal. The increased fees would be more than offset, however, by the anticipated savings from using larger coal-carrying ships. 5/

FEDERAL BLOCK GRANTS

A block grant option--modeled after the 1981 Domenici-Moynihan proposal (S. 621)--could reduce delays associated with federal control over intrastate projects while achieving efficiency gains in constructing interstate projects. In addition to higher nonfederal cost-sharing rates, states would finance a significantly higher share of water project construction.

The federal government would invest in two types of water projects--regional (interstate) projects, and intrastate projects. Regional projects could include large multipurpose reservoirs or projects involving interstate transfers of water serving several states, to the extent that such projects could still be justified on economic grounds. But, since such facilities are largely in place, regional investments would probably focus on rehabilitation and maintenance of the inland waterway system.

Each year, the Congress would appropriate a fixed level of intrastate project funding that would be allocated to the states based on population, land area, or some other proxy for "need." In order to receive these funds,

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5. For additional details, see Congressional Budget Office, "Statement of Alice M. Rivlin, Director, before the Subcommittee on Water Resources of the Senate Committee on Environment and Public Works (May 18, 1983).

states would have to match them with their own funds. Unused allocations would be redistributed to other states according to the original allocation formula. States could use federal allocations for any water resources purpose they chose.

Under the 1981 Domenici-Moynihan proposal, the states would pay a minimum of 25 percent of feasibility study costs, 25 percent of project construction costs, and 50 percent of operation and maintenance costs. If, under existing cost-sharing conventions, the nonfederal share of a particular type of project was higher than these minimum rates, the higher rate would prevail. These minimum rates for project construction and operation are very close to the historical mean nonfederal rates--24 percent of construction costs and 58 percent of operation and maintenance costs. In the past, states did not pay for any study costs. While the "economically optimal" matching ratios under a block grant approach are debatable, for purposes of discussion this option assumes a 50 percent state match for construction and operations and a 25 percent state match for feasibility studies.

States would be responsible for maintaining two priority lists, one for feasibility studies and one for potential construction projects. Each list would incorporate any backlogged projects that the state wanted considered. A project would be placed on the state priority list of authorized projects ready for construction if three conditions were met: the feasibility study indicated a feasible solution to the water problem (on economic, environmental, and engineering grounds), the state certified that the project should be on the list, and there were no objections to construction from neighboring states. If one or more of these conditions were not met, a project could still go forward, but only after Congressional review and authorization.

Regional projects would be selected by a board composed of representatives from the Corps, the Bureau, the TVA, and the SCS, and five members-at-large (recognized experts in regional water resources development). The federal government would pay all costs for regional projects, establish cost-recovery mechanisms for all marketable benefits, and operate the facilities after construction. The board would also serve as a clearinghouse for feasibility and authorization information.

Economic Efficiency under Block Grants

Under the block grant option, economically efficient intrastate projects would be encouraged but not guaranteed. User fees would not be mandatory; a state could choose to subsidize groups of users if it so desired. Block grants for intrastate projects would match costs to beneficiaries only to the extent that matching ratios approximated the ratio of marketable to

nonmarketable benefits and to the extent that states chose to pass the correct share of the marketable costs through to users. The generally higher state contribution to intrastate investments, however, would certainly encourage consideration of higher user fees. By contrast, interstate project construction would be conditioned by users' willingness to pay appropriate fees, promoting more economically efficient investments in regional projects.

Under this option, a reduced nonfederal share for hydroelectric power and municipal water supply projects could encourage relatively more of these projects than under current policy. A higher nonfederal share for all other projects, however, could discourage their construction (see Table 6). Overall, states and/or users would end up paying about 22 percent more for water projects than they do now, which in turn could result in more efficient new construction investment decisions. Adjusting the nonfederal share by project type to reflect more nearly the marketability of benefits could also be accommodated within the block grant structure. Potential efficiency gains from doing so would have to be balanced against any increased state financing burden.

The current cumbersome process for feasibility studies and authorizations would be shortened considerably and removed from Congressional consideration, except under limited circumstances. Feasibility study periods could be limited to three years, with authorization 90 days later. Construction could then begin immediately. By comparison, in a study of 115 projects undertaken by the Corps in 1966, it took an average of 10.8 years for a study to move from authorization to approval by Congress and then 6 more years to begin construction after authorization. 6/

Effects on the Federal Budget

This option could have varying effects on the federal budget, depending upon the level of appropriations set each year by the Congress. Unlike the loan program, however, this decision would remain with the Congress, and the federal budgetary exposure could thus be limited. It is reasonable to assume that the fiscal year 1982 level of federal appropriations for water resources--about $3.7 billion for construction and operations--would serve as an initial level of funding under this option. If this were the case, roughly

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6. See U.S. Department of the Army, Office of the Chief of Engineers, "Report of the Chief of Engineers on Survey Report Procedures to the Committee on Public Works, House of Representatives," unpublished paper (April 1966).

TABLE 6. CURRENT MEAN, EFFECTIVE NONFEDERAL CAPITAL COST SHARING RATES COMPARED TO COST-SHARING RATES UNDER THE BLOCK GRANT PROPOSAL, BY PROJECT PURPOSE

Project Purpose	Effective Nonfederal Share of Project Capital Costs		Net Differences (In percentage points)
	Under Current Policy (In percents)	Under Block Grants (In percents)	
Urban Flood Damage Reduction	17	50	+33
Rural Flood Damage Reduction	7	50	+43
Drainage	42	50	+8
Irrigation	11	50	+39
Erosion Control	37	50	+13
Municipal and Industrial Supply	62	50	-12
Water Quality Control	31	50	+19
Fish and Wildlife Preservation	8	50	+42
General Recreation	17	50	+33
Navigation a/	16	50	+34
Hydroelectric Power	64	50	-14
Mean, All Project Types b/	28	50	+22

a. Not including inland navigation projects. These would be funded entirely by federal project grants. Federally administered user fees would recover up to 100 percent of the federal investment.

b. Weighted by level of expenditures within individual project types.

$1.5 billion would be allocated to intrastate projects. 7/ If all these funds were matched equally by the states, about $5.2 billion worth of combined federal and state water resources expenditures could be leveraged with federal outlays held at the 1982 level.

Effects On The States

Under a block grant approach, the nonfederal contributions to water projects would have to be provided by the states in the form of either up-front financing or noncash contributions, such as land, easements, or rights-of-way. Under current policy, the nonfederal share is often provided by users over a 50-year period. Thus, block grants with high matching ratios imply an increased financing burden on the states. Before or during construction of an irrigation project, for example, the state would have to provide 50 percent of the capital costs. States would be faced with raising this development capital by appropriating from general revenues (tax collections); issuing development bonds (general obligation or revenue bonds, depending on the type of project); or transferring, in part or entirely, the burden of capital formation to those localities that stand to benefit from the water project. 8/

For some types of projects, the nonfederal financing share would change dramatically under this proposal. For example, the state financing

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7. This estimate was derived by combining that portion of each of the four federal water agencies' 1982 appropriations that funded essentially intrastate projects. Included were the Corps' local flood control projects; portions of several other Corps' accounts, SCS projects constructed under P.L. 534 and P.L. 566; and portions of the Bureau's construction account.

8. State financing of water projects is not new. In 1982, in addition to financial obligations fulfilled by states to participate in federal projects, every state actively funded its own water development projects through various financing techniques, including appropriating funds from general revenue (in 36 states for a total of $490 million), issuing general obligation bonds (in 27 states for a total face value of about $2.4 billion), issuing revenue bonds (in 11 states for a total face value of about $700 million), and dedicating taxes and collecting user fees (in 26 states for a total of about $300 million). For details, see Congressional Budget Office, Current Cost-Sharing and Financing Policies for Federal and State Water Resources Development (July 1983).

share of a rural flood control project would increase by 43 percent. The state share of financing fish and wildlife benefits would increase by 42 percent, and the state financing burden for irrigation projects would increase by 39 percent. For municipal water supply and hydropower projects, the up-front financing burden on the states would be increased substantially over current policy, even though the ultimate burden of payment would actually be lower than it is currently. Although it is arguable that these types of projects should be locally financed anyway, this upward shift in financing requirements could prohibit some states from participating fully in the grant program.

The way that the block grants would be distributed could also have an important effect on the states. Under an allocation formula based on population and land area, historical trends in regional distribution of federal funds would be altered. Southern and western states--the recipients of about 40 percent and 36 percent, respectively, of overall federal water spending between 1956 and 1980--would receive about 31 percent each under the block grant option. Northeastern and north central states, which received about 6 percent and 19 percent, respectively, of all federal water spending between 1956 and 1980, would get about 13 percent and 25 percent under the new block grants (see Table 7). Distribution of federal funding for regional projects could alter these estimates.

Effect on Users

Direct beneficiaries of marketable products from interstate, federally funded water projects would pay user fees to the federal government in an amount sufficient to recover the federal investment. Shippers on the inland waterways, for example, would pay full-cost user fees under this option, with effects identical to those described under the loan program.

Although fees for local port and harbor dredging would not be mandatory under this option, states could choose to impose them in order to recover their increased costs for such projects. Similarly, local projects supplying hydroelectric power and water for agricultural, municipal, or industrial use could cost users more if states chose to recover their increased costs.

FEDERAL PROJECT GRANTS UNDER A LIMITED FEDERAL ROLE

This option recognizes that most of the federally important water projects have already been built and would, therefore, accelerate a transition from federal to state responsibility for new intrastate water project

TABLE 7. REGIONAL DISTRIBUTION OF FEDERAL WATER EXPENDITURES UNDER THE BLOCK GRANT OPTION COMPARED TO THE HISTORICAL DISTRIBUTION

Region	Percent of All Federal Water Expenditures 1956 through 1980	Percent of Federal Funds Under Federal Block Grants a/
Northeast b/	6.0	13.4
North Central c/	18.7	24.7
South d/	39.7	30.8
West e/	35.7	31.1

SOURCE: Congressional Research Service, Environment and Natural Resources Division, unpublished data developed at the request of the staff of the Senate Committee on Environment and Public Works (March 1982).

a. Excluding distribution of federal expenditures for regional projects.

b. Northeastern States: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont.

c. North Central States: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin.

d. Southern States: Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia.

e. Western States: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

construction. An independent review board would select among projects that were interstate or international in scope (multistate inland navigation or reservoir systems or international stream flow), produced significant benefit or cost spillovers from one state to another (water quality, control, stream flow regulation), or entailed national defense or security benefits (some harbor improvements). Existing projects and those currently under construction that met these criteria would remain under current financing and administrative policies. Financial and administrative responsibility for all other current projects would be transferred to the states over a period of ten years. Any new projects that met the criteria for federal interest would be constructed under current project evaluation, selection, and financing conventions. Federally administered user fees would be instituted to recover the costs of providing marketable benefits. Receipts would accrue to the federal government and to the states in proportion to their financing contribution.

All new water projects that did not meet the criteria for federal interest would be financed and managed by the states, which would be given full authority to levy user fees sufficient to pay for construction and operation. In addition, the states could retain federal agencies under contract for construction, engineering, planning, or other technical support, if they chose to do so. Terms for payment could be based on the actual federal cost of these services.

Economic Efficiency Under a Limited Federal Role

For those new projects judged to be of significant federal interest and offering a marketable benefit, federal funds for construction or operation would be repaid over time by users through a federally administered system of user fees. Hence, matching costs to beneficiaries would condition investments with users' willingness to pay, in turn reducing the tendency for overinvestment in these projects. For federally important projects that produced nonmarketable benefits, current cost-sharing conventions would prevail, and thus some potential would still exist for inefficient federal spending.

Federal project selection would not necessarily become less complicated under this option. The definition of "federally important" is imprecise and open to debate. States or other local project proponents seeking federally subsidized water projects would have an incentive to lobby for their projects by trying to prove that they, indeed, had federally important attributes. Thus, there is potential for this option to become little more than current policy, perhaps with federally administered user fees.

Effects on the Federal Budget

Federal outlays could be reduced significantly under this option. If the fiscal year 1982 level of spending for "federally important" projects was maintained over the ten-year phase-in period, total federal outlays for construction and operation of water projects would drop about 5 percent a year, from $3.7 billion in fiscal year 1982 to about $2.2 billion in fiscal year 1992 (see Table 8). Thus, after the phase-in period, federal outlays would be about 40 percent lower than 1982 spending.

TABLE 8. PROJECTED FEDERAL OUTLAYS FOR WATER RESOURCES CONSTRUCTION AND OPERATION UNDER A LIMITED FEDERAL ROLE (BY fiscal year, in billions of 1982 dollars) a/

Year	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Outlays	3.7	3.5	3.3	3.2	3.0	2.9	2.7	2.6	2.5	2.3	2.2

a. Estimate ignores a further reduction in outlays from offsetting receipts from federally assessed user fees.

Effect on the States

Of the three options discussed in this chapter, this option would put the greatest financial burden on the states, including the added costs of operating and managing existing intrastate projects, financing any new intrastate projects, and meeting existing cost-sharing requirements for federally important projects. Out of about $3.7 billion in federal expendi-

tures for water resources in fiscal year 1982, about $1.5 billion (41 percent) would have been a state responsibility under this option. 9/

To be sure, without federal assistance, some states would be at a significant financial disadvantage relative to other states. Although it is difficult to measure, two types of states could be worse off: those that have relied most heavily on federal subsidies, and those with limited capacity to raise development capital. States with significant energy resources and/or expanding industrial and population bases may have an advantage in raising capital for water projects.

Effects on Users

Direct beneficiaries of federal investments would pay higher prices for water and water services if this option was implemented. Shippers on the inland waterways, for example, would pay an average of 16 percent more under full-cost recovery user fees. If user fees were set by specific segments, several low-volume, high-cost waterways would probably close (namely, Appalachicola/Flint, Kentucky, Ouachita/Red, Arkansas, Tennessee-Tombigbee), forcing shippers to seek alternative rail or truck transportation.

In addition, depending on the response of the states to their new water development responsibilities, beneficiaries of other types of water projects could also pay significantly more for water and related services. Based on current subsidies, farmers could end up paying five times more under full-cost recovery than they now pay for irrigation water; the price of hydroelectric power and municipal water supply could increase by 50 percent; and port and harbor fees for some high-cost, low-volume ports could be high enough to make operations uneconomic. Phasing in higher fees would help reduce sudden economic hardship and allow users to make necessary adjustments to increased costs.

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9. This estimate is based on transferring to the states over a ten-year period the following federal activities: small watershed and local flood control activities of the SCS; up to half of the Bureau's construction activities; the Corps' local flood protection, beach erosion control, and recreation activities; and portions of the Corps' harbor dredging, multipurpose reservoir, major rehabilitation and dam safety, and Mississippi River and Tributaries activities.